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in its capacity as elected Office

16 August 2000 (16.08.00)

**PCT/NL99/00756**

98.1067 WO

09 December 1999 (09.12.99)

09 December 1998 (09.12.98)

PENNINGS, Jacobus, Petrus, Maria et al

- ☒

in the demand filed with the International Preliminary Examining Authority on:

06 July 2000 (06.07.00)

7

in a notice effecting later election filed with the International Bureau on:

- 

was

1

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

**Facsimile No.: (41-22) 740.14.35**

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## PCT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

JILDERDA, Anne, Ayolt  
Octrooibureau LIOC  
P.O. Box 13363  
NL-3507 LJ Utrecht  
PAYS-BAS

C. VAN NINGEN

23 JUN 2000

OCTROOIBUREAU LIOC

Date of mailing (day/month/year) 15 June 2000 (15.06.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference 98.1067 WO			
International application No. PCT/NL99/00756	International filing date (day/month/year) 09 December 1999 (09.12.99)	Priority date (day/month/year) 09 December 1998 (09.12.98)	
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU,CN,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,  
GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,  
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The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 48.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
15 June 2000 (15.06.00) under No. WO 00/35199

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

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# RECORD COPY

1/4

## PCT REQUEST

98.1067 WO

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0	For receiving Office use only	
0-1	International Application No.	PCT/NL 99 / 007 56
0-2	International Filing Date	09 DEC 1999 (09.12.99)
0-3	Name of receiving Office and "PCT International Application"	BUREAU VOOR DE INDUSTRIËLE EIGENDOM P.C.T. INTERNATIONAL APPLICATION
0-4	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.90 (updated 15.10.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Netherlands Industrial Property Office (RO/NL)
0-7	Applicant's or agent's file reference	98.1067 WO
I	Title of invention	TELECOMMUNICATION SYSTEM AND CONNECTION DEVICE FOR USE IN IT
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
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II-5	Address:	S-12625 S-S-12625 Stockholm Sweden
II-6	State of nationality	SE
II-7	State of residence	SE
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III-1-2	Applicant for	US only
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III-1-7	State of residence	NL

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IV-1	<b>Agent or common representative; or address for correspondence</b> The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
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V	<b>Designation of States</b>	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

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<b>V-5</b>	<b>Precautionary Designation Statement</b> In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
<b>V-6</b>	<b>Exclusion(s) from precautionary designations</b>	<b>NONE</b>
<b>VI-1</b>	<b>Priority claim of earlier national application</b>	
VI-1-1	Filing date	<b>09 December 1998 (09.12.1998)</b>
VI-1-2	Number	<b>1010769</b>
VI-1-3	Country	<b>NL</b>
<b>VI-2</b>	<b>Priority document request</b> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	<b>VI-1</b>
<b>VII-1</b>	<b>International Searching Authority Chosen</b>	<b>European Patent Office (EPO) (ISA/EP)</b>
<b>VII-2</b>	<b>Request to use results of earlier search; reference to that search</b>	
VII-2-1	Date	<b>08 January 1999 (08.01.1999)</b>
VII-2-2	Number	<b>SN 33370 NL</b>
VII-2-3	Country (or regional Office)	<b>EP</b>
<b>VIII</b>	<b>Check list</b>	number of sheets      electronic file(s) attached
VIII-1	Request	<b>4</b> -
VIII-2	Description	<b>17</b> -
VIII-3	Claims	<b>4</b> -
VIII-4	Abstract	<b>1</b> <b>981067.txt</b>
VIII-5	Drawings	<b>2</b> -
VIII-7	<b>TOTAL</b>	<b>28</b>
	<b>Accompanying items</b>	paper document(s) attached      electronic file(s) attached
VIII-8	Fee calculation sheet	✓      -
VIII-16	PCT-EASY diskette	- <b>diskette</b>
VIII-18	Figure of the drawings which should accompany the abstract	<b>2</b>
VIII-19	Language of filing of the international application	<b>Dutch</b>
<b>IX-1</b>	<b>Signature of applicant or agent</b>	
IX-1-1	Name (LAST, First)	<b>JILDERDA, Anne, Ayolt</b>

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10-1	Date of actual receipt of the purported international application	09 DEC 1999 (09.12.99)
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	

## FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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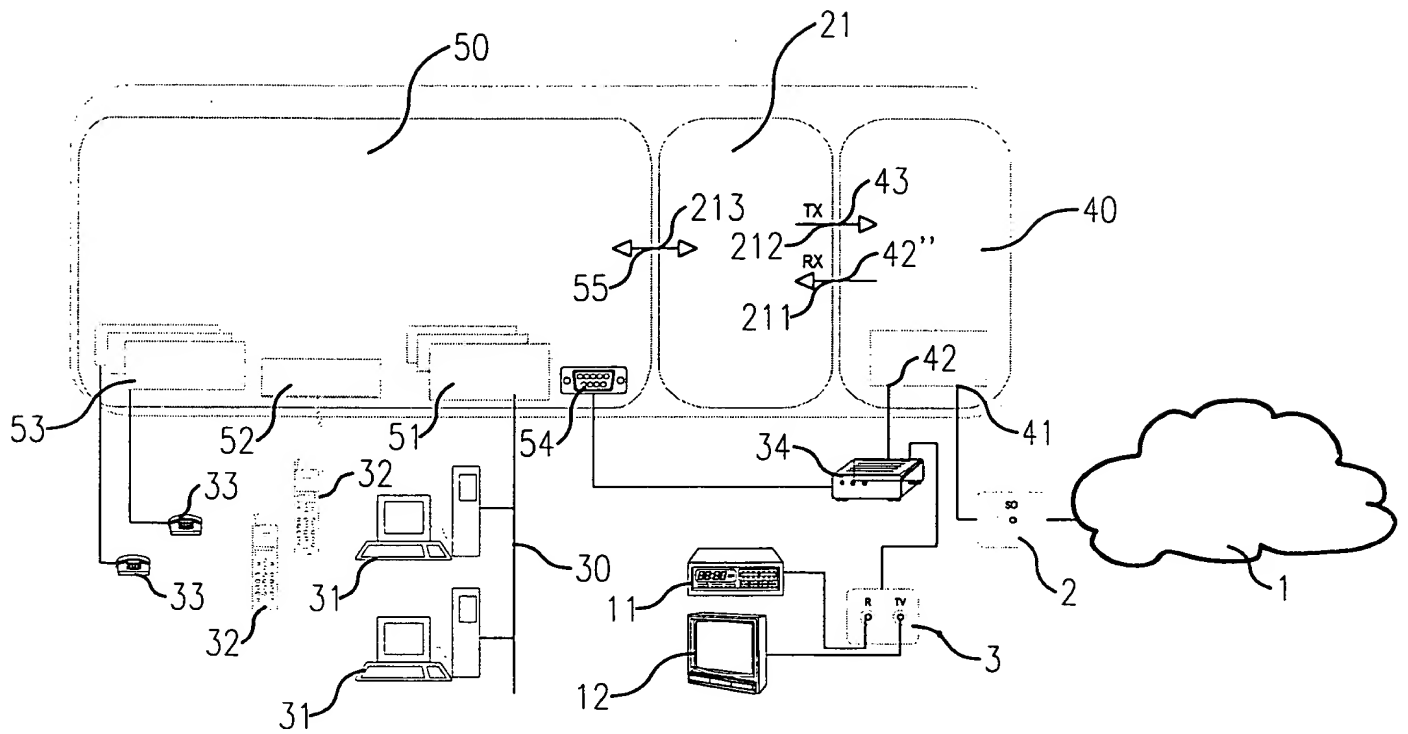


Fig. 1

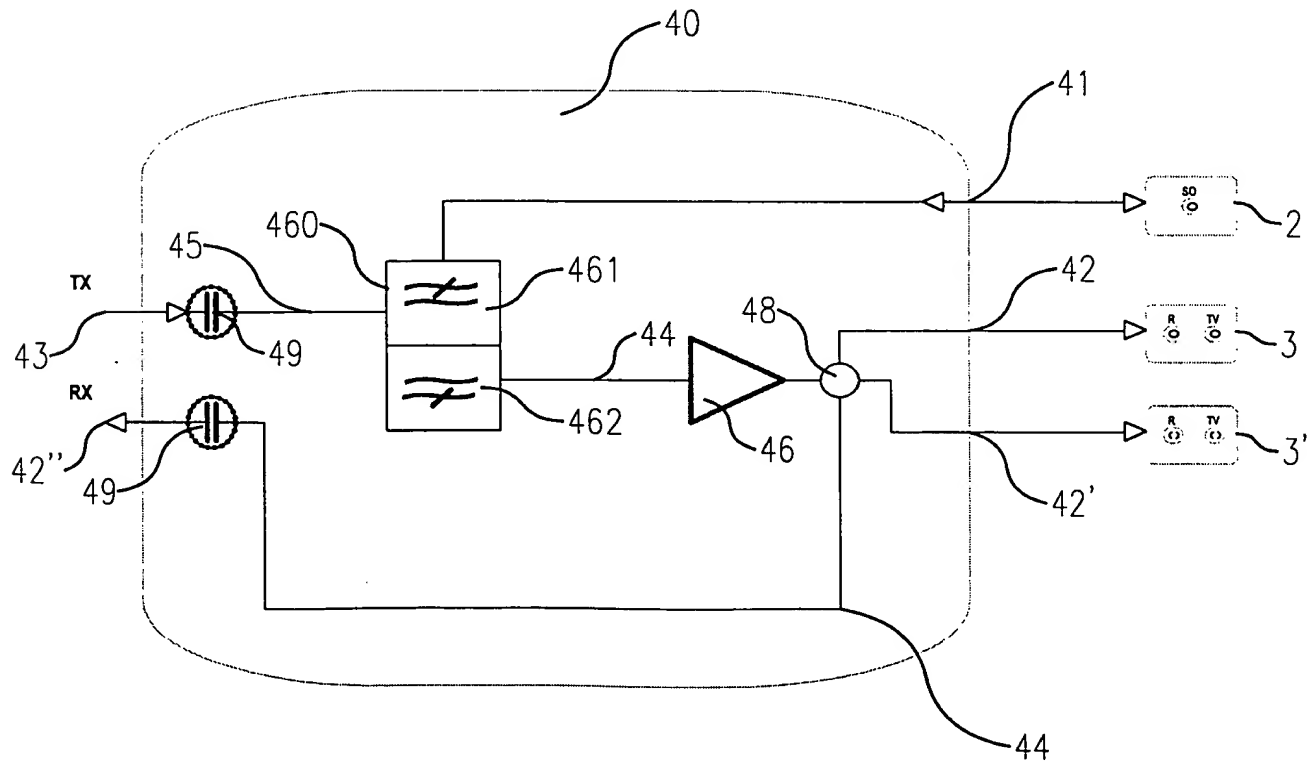
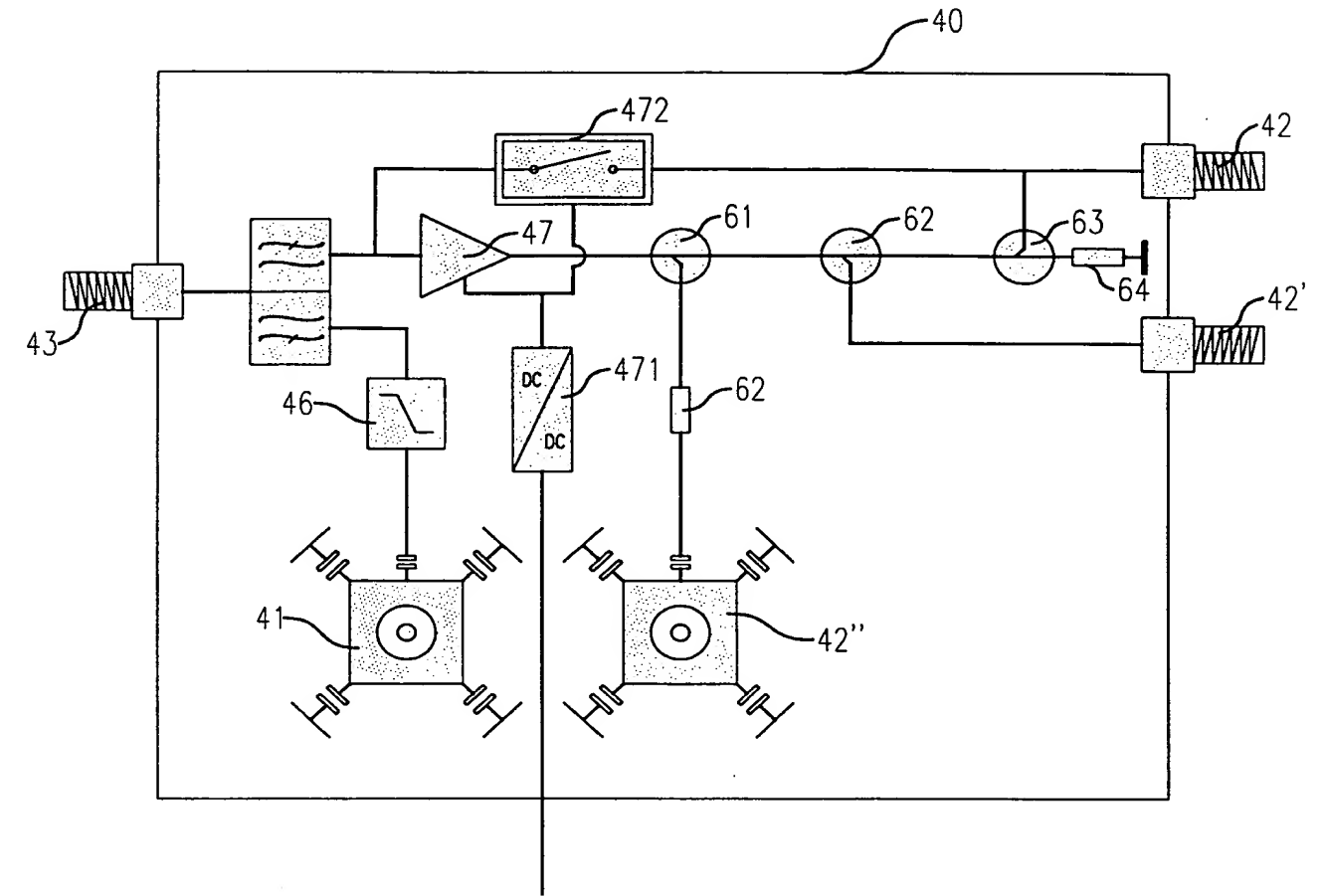


Fig. 2



**Fig.3**



Telecommunicatiesysteem een aansluitinrichting ten gebruike daarin.

De onderhavige uitvinding heeft betrekking op een telecommunicatiesysteem  
omvattende eerste telecommunicatiemiddelen in staat tot het ontvangen van een eerste  
5 telecommunicatiesignaal in een eerste frequentiedomein, tweede  
telecommunicatiemiddelen in staat tot het zenden van een tweede  
telecommunicatiesignaal in een tweede frequentiedomein en een  
telecommunicatienetwerk. Voorts heeft de uitvinding betrekking op een  
aansluitinrichting voor het aan een gemeenschappelijke telecommunicatieverbinding  
10 koppelen van eerste telecommunicatiemiddelen in staat tot het ontvangen van een eerste  
telecommunicatiesignaal in een eerste frequentiedomein alsmede van tweede  
telecommunicatiemiddelen bestemd voor het zenden van een tweede  
telecommunicatiesignaal in een tweede frequentiedomein, omvattende een uitgang voor  
de eerste telecommunicatiemiddelen, een ingang voor de tweede  
15 telecommunicatiemiddelen en een gemeenschappelijke aansluiting voor de  
telecommunicatieverbinding.

Telecommunicatiediensten vinden voor het merendeel plaats over toegesneden  
telecommunicatienetwerken. Zo wordt voor spraakoverdracht overwegend gebruik  
20 gemaakt van publieke telefoonnetwerken, aangeduid als PSTN (Public Switched  
Telephony Network) en zijn er voor gegevens uitwisseling tussen computers tal van  
specifiek voor dat doel ontworpen datanetwerken operationeel. Video- en audiosignalen  
vinden gewoonlijk hun weg door de ether en in tal van geïndustrialiseerde landen in  
toenemende mate in kabeltelevisienetwerken die zijn gebouwd op hoogwaardige  
25 transportmedia zoals glasfiber- en co-axiale kabels. Een gebruiker die van al deze  
diensten gebruik wenst te maken, zal bijgevolg over een overeenkomstig aantal  
aansluitvoorzieningen dienen te beschikken.

De voortschrijdende informatisering van de maatschappij leidt tot steeds verdere  
30 uitbreiding van bestaande telecommunicatiediensten of zelfs tot een opkomst van steeds  
weer nieuwe telecommunicatiediensten, die bovendien in toenemende mate op  
particuliere gebruikers zijn gericht. Deze diensten zijn daarenboven in toenemende mate  
interactief, waarbij soms hoge datadoorvoer-snelheid wenselijk zijn om grote

hoeveelheden informatie in een acceptabel tijd naar de gebruiker toe te kunnen verzenden. Voorbeelden hiervan zijn vormen van telemetrie, pay-per-view en met name het internet dat door de verdergaande implementatie van multi-media toepassingen bovendien een steeds hogere datadoorvoer-snelheid vergt.

5

Omdat de maximale datadoorvoer-snelheden en de haalbare bandbreedte van een publiek telefoonnetwerk bij dergelijke interactieve diensten meer en meer als beperking wordt ervaren, wordt naarstig gezocht naar alternatieve netwerken voor dataoverdracht. Een kandidaat die zich daarbij aandient, is het kabeltelevisienetwerk zoals dat in veel  
10 geïndustrialiseerd landen inmiddels wijd vertakt is aangelegd. Dit netwerk onderscheidt zich van het publieke telefoonnetwerk doordat het tot aan de eindgebruiker is gebaseerd op een hoogwaardig transportmedium dat varieert van hoogwaardige glasfiberverbindingen in hoger in het netwerk gelegen delen tot hoogwaardige co-axiale kabels voor aansluiting van de abonnees. Dergelijke verbindingen bieden een  
15 aanmerkelijk grotere bandbreedte en staan een aanmerkelijk hogere doorvoersnelheid toe dan het publieke telefoonnetwerk waarop abonnees door middel van een simpel paar in elkaar gedraaide koperdraden is aangesloten. Bovendien is de integriteit van digitale signalen in een dergelijk hoogwaardig netwerk beter gewaarborgd.

20 Kabeltelevisienetwerken werden evenwel primair ontworpen voor de distributie van radio- en televisieprogramma's wat zich afspeelt in één richting vanuit het netwerk naar de abonnees toe. Retourverkeer van de abonnee naar hoger in het netwerk gelegen delen, zoals het tweede telecommunicatiesignaal van de in de aanhef genoemde tweede telecommunicatiemiddelen, was in eerste aanleg niet voorzien doch wordt in  
25 hedendaagse telecommunicatie meer en meer vereist. Om dit laatste mogelijk te maken worden bestaande kabeltelevisienetwerken in toenemende mate opgewaardeerd en geschikt gemaakt voor tweewegverkeer. Deze aanpassingen bestaan hoofdzakelijk in het aanbrengen van bypass-filters en bypass-versterkers die parallel aan de bestaande versterkers in het netwerk doorgifte van retoursignalen mogelijk maken. Deze  
30 retoursignalen bevinden zich daarbij in een relatief laag frequentiedomein dat niet wordt ingenomen door de te distribueren radio- en televisiekanalen en minder last heeft van

signaaldemping. Een probleem dat zich daarbij voordoet is dat na een dergelijke  
aanpassing van het netwerk niet alleen dataverkeer in de retourrichting mogelijk is, maar  
dat ook ruis die bij eindgebruiker wordt gegenereerd, aangeduid als ingress noise, nu  
vrijelijk het netwerk kan binnentreden en versterkt wordt doorgegeven. Ingress noise is  
5 voor een belangrijk deel afkomstig van aansluitkabels die in huis worden gebruikt voor  
het aansluiten van de aldaar aanwezige apparatuur. Dergelijke kabels werken daarbij als  
antennes die eventuele elektromagnetische storingen in huis invangen en aan het  
kabelnetwerk doorgeven. Dit laatste is vanzelfsprekend ongewenst, te meer omdat juist  
de lagere frequentiebanden waarin het digitale datatransport dient plaats te vinden  
10 betrekkelijk ruisgevoelig zijn.

Een andere bijkomstigheid is dat bij tweeweg gebruik van een kabeltelevisienetwerk  
niet langer uitsluitend ontvangende toestellen, zoals een radio- of televisieontvanger, bij  
een eindgebruiker aanwezig zullen zijn maar ook zendende apparatuur voor het  
15 verzenden van retoursignalen. Indien alle apparatuur eenvoudigweg gezamenlijk op de  
bestaande aansluitvoorziening voor het kabeltelevisienetwerk wordt aangesloten, zullen  
de retoursignalen van dergelijke zendende apparatuur onvermijdelijk tevens naar de  
ontvangende toestellen vloeien en kunnen interfereren met de daarvoor bestemde  
communicatiesignalen. Doorsnee zendapparatuur voor kabeltelevisienetwerken is  
20 gewoonlijk optimaal afgeregeld voor het verzenden van signalen zonder rekening te  
houden met de invloed daarvan op eventuele overige aanwezige apparatuur. Het  
uitgangsniveau bedraagt hierbij gewoonlijk 80-115 dB $\mu$ V. Aangezien televisie- en  
radiosignalen standaard worden afgeregeld op een vastgesteld niveau van 60-80 dB $\mu$ V,  
leidt dit al snel tot een hinderlijk storing van de ontvangen radio- en  
25 televisieprogramma's.

Met de onderhavige uitvinding wordt ondermeer beoogd te voorzien in een  
telecommunicatiesysteem en een aansluitinrichting van de in de aanhef genoemde soort  
waarmee gedeeld gebruik van een aansluiting van een telecommunicatienetwerk  
30 mogelijk, terwijl de hiervoor beschreven problemen althans grotendeels worden  
tegengegaan.

Om het beoogde doel te bereiken heeft een aansluitinrichting van de in de aanhef genoemde soort volgens de uitvinding als kenmerk dat de aansluitinrichting naar de ingang en de uitgang afzonderlijke signaalpaden omvat die door tussenkomst van scheidingsmiddelen aan de gemeenschappelijke aansluiting voor de

5 telecommunicatieverbinding zijn gekoppeld en dat de scheidingsmiddelen in staat zijn om het eerste telecommunicatiesignaal althans nagenoeg uitsluitend over een eerste signaalpad tussen de uitgang en de gemeenschappelijk aansluiting en het tweede telecommunicatiesignaal althans nagenoeg uitsluitend over een tweede signaalpad tussen de gemeenschappelijke aansluiting en de ingang te leiden. De uitvinding berust

10 daarbij op het inzicht dat door een effectieve scheiding bij de gebruiker van de signaalpaden voor het stroomafwaartse en stroomopwaartse communicatieverkeer onderlinge interferentie en tevens instroom van ruis in het netwerk kunnen worden teruggedrongen. In de aansluitinrichting volgens de uitvinding betekent dit dat stroomopwaarts signaalverkeer, dat afkomstig zal zijn van de tweede

15 telecommunicatiemiddelen, geheel over het tweede signaalpad wordt geleid, terwijl het stroomafwaartse signaalverkeer, bestemd voor de eerste telecommunicatiemiddelen, via het eerste signaalpad zijn weg vindt. Aldus zijn beide verkeersstromen van elkaar afgeschermd zodat onderlinge interferentie wordt tegengegaan.

20 Een bijzondere uitvoeringsvorm van de aansluitinrichting volgens de uitvinding is daarbij gekenmerkt doordat de scheidingsmiddelen frequentiefiltermiddelen omvatten in staat om beide telecommunicatiesignalen over hun respectieve signaalpaden te leiden. Door het verkeer in beide richtingen in het netwerk althans in hoofdzaak strikt in verschillende frequentiedomeinen te laten verlopen kan met dergelijke

25 scheidingsmiddelen betrekkelijk eenvoudig worden voorzien in de beoogde scheiding beide signaalpaden. Meer in het bijzonder is een dergelijke bijzondere uitvoeringsvorm volgens de uitvinding gekenmerkt doordat de frequentiefiltermiddelen een laag-doorlaatfilter omvatten met een grenswaarde boven een laagste van het eerste- en tweede frequentiedomein alsmede een hoogdoorlaatfilter met een grenswaarde beneden

30 een hoogste van het eerste- en tweede frequentiedomein. Het stroomopwaartse verkeer, waaronder het tweede communicatiesignaal, speelt zich daarbij bij voorkeur af in het

laagste frequentiedomein terwijl voor het stroomafwaartse verkeer, zoals het eerste communicatiesignaal, het hogere frequentiedomein wordt gealloceerd. De lagere frequentiebanden zullen in veel bestaande kabeltelevisienetwerken voor het retourverkeer nog voorhanden zijn zodat daarin het stroomopwaartse verkeer kan plaatsvinden. Een bijkomend voordeel is daarbij de geringere signaaldemping bij lagere frequenties, zodat minder of minder krachtige versterkers in het retourpad van het netwerk behoeven te worden opgenomen.

De althans in hoofdzaak strikte scheiding van beide signaalpaden in de aansluitinrichting volgens de uitvinding biedt tevens een mogelijkheid om de instroom van ruis en andere ongewenste signalen in het netwerk sterk te reduceren. Een voorkeursuitvoeringsvorm van de aansluitinrichting is daartoe volgens de uitvinding gekenmerkt doordat in het signaalpad voor de eerste telecommunicatiemiddelen gelijkrichtingsmiddelen zijn opgenomen die in staat zijn om signaaltransport in een richting tegengesteld aan die van het eerste telecommunicatiesignaal althans grotendeels te onderdrukken. Doordat de gelijkrichtingsmiddelen iedere signaalstroom in opwaartse richting in het eerste signaalpad althans grotendeels onderdrukken, wordt het binnentreden van ingress noise in het netwerk via het eerste signaalpad effectief vermeden. Omdat het gewenste retourverkeer vanuit de tweede telecommunicatiemiddelen zich volledig in het afgescheiden tweede signaalpad afspeelt, ondervindt dit geen hinder van de gelijkrichtingsmiddelen. Een specifieke uitvoeringsvorm van de aansluitinrichting heeft in dit opzicht volgens de uitvinding als kenmerk dat de gelijkrichtingsmiddelen een operationele versterker omvatten.

Om interactieve diensten, zoals internet, telefonie en pay-per-view, mogelijk te maken is een verdere uitvoeringsvorm van de aansluitinrichting volgens de uitvinding gekenmerkt doordat de inrichting een aantal uitgangen omvat, waarvan er ten minste één voor de tweede telecommunicatiemiddelen is bestemd. Gebruik makend van deze uitvoeringsvorm zullen van de tweede telecommunicatiemiddelen uitgaande signalen althans in hoofdzaak strikt over het tweede signaalpad verlopen, terwijl inkomende signalen althans in hoofdzaak strikt over het eerste signaalpad worden geleid. Dit biedt

de tweede telecommunicatiemiddelen de mogelijkheid van tweewegverkeer met behoud van de voordelen van de uitvinding. Het verzenden van informatie geschiedt daarbij in het tweede frequentiedomein, terwijl informatie in het eerste frequentiedomein wordt ontvangen. Aldus is dankzij de uitvinding full-duplex tweewegverkeer mogelijk zonder  
5 hinderlijke interferentie van de inkomende en uitgaande signalen. Omdat gewoonlijk aanmerkelijk meer informatie zal worden ontvangen dan verzonden, heeft het de voorkeur om het eerste frequentiedomein hoger te kiezen dan het tweede met het oog op de grotere bandbreedte in dat hogere domein.

10 Een verdere voorkeursuitvoeringsvorm heeft hierbij volgens de uitvinding als kenmerk dat in een signaalpad tussen een eerste uitgang en een tweede uitgang verzwakkingsmiddelen zijn opgenomen. Aldus wordt niet alleen tussen de ingang en de uitgang van de inrichting een signaalscheiding aangebracht, maar ook tussen de uitgangen onderling. Interferentie vanuit een uitgang naar een naburige uitgang kan door  
15 middel van de verzwakkingsmiddelen effectief worden onderdrukt zonder dat het nuttige signaal daaronder behoeft te lijden. In dit verband heeft een verdere bijzondere uitvoeringsvorm van de aansluitinrichting volgens de uitvinding als kenmerk dat de verzwakkingsmiddelen ten minste één directionele koppelaar omvatten. Een dergelijke koppelaar heeft een ingang en ten minste twee uitgangen, waarvan er één slechts een  
20 geringe en de andere een beduidende verzwakking kent. Door dergelijke elementen tussen opvolgende uitgangen te plaatsen kan een adequate signaalscheiding worden bewerkstelligd.

In een verdere voorkeursuitvoeringsvorm heeft de aansluitinrichting volgens de  
25 uitvinding daarbij verder als kenmerk dat althans de uitgang voor de tweede telecommunicatiemiddelen elektrisch is geïsoleerd voor gelijkstroom. Aldus wordt een elektrische ont koppeling bereikt van de tweede telecommunicatiemiddelen als het gaat om gelijkstroomcomponenten in het signaal dat via de genoemde aansluiting daaraan wordt aangeboden. Een eventuele overspanning vanuit het netwerk of vanaf de eerste  
30 telecommunicatiemiddelen deert in dat geval de tweede telecommunicatiemiddelen niet. Dit is in het bijzonder van belang indien de eerste telecommunicatiemiddelen een ouder

type televisieontvanger omvatten, waarvan het chassis in voorkomende gevallen op een hoge spanning staat. Indien in dat geval de netwerkaansluiting in de televisieontvanger niet adequaat is geaard, wordt in deze voorkeursuitvoeringsvorm niettemin vermeden dat de genoemde hoge spanning nadelige gevolgen heeft voor de tweede  
5 telecommunicatiemiddelen.

Om onder meer hedendaagse maar ook toekomstige telecommunicatiediensten mogelijk te maken heeft een telecommunicatiesysteem van de in de aanhef genoemde soort volgens de uitvinding als kenmerk dat de eerste- en tweede telecommunicatiemiddelen  
10 door tussenkomst van een hiervoor omschreven aansluitinrichting volgens de uitvinding aan het telecommunicatienetwerk zijn gekoppeld. Het telecommunicatienetwerk kan daarbij in beginsel ieder willekeurig bestaand of toekomstig netwerk zijn doch omvat in een bijzondere uitvoeringsvorm volgens de uitvinding een kabeltelevisienetwerk, bestemd voor distributie van radio- en/of televisieprogramma's, waarbij de eerste  
15 telecommunicatiemiddelen een radio-ontvanger en/of een televisie-ontvanger omvatten. Zoals hiervoor reeds vermeld, biedt een dergelijk netwerk doorgaans een bijzonder hoogwaardige infrastructuur die grote datastromen toelaat en een geringe distorsie kent.

Een bijzondere uitvoeringsvorm van het telecommunicatiesysteem volgens de  
20 uitvinding is gekenmerkt doordat de tweede telecommunicatiemiddelen conversiemiddelen omvatten die enerzijds aan een ingang en een uitgang van de aansluitinrichting en anderzijds aan digitale derde telecommunicatiemiddelen zijn gekoppeld. De conversiemiddelen zijn in staat tot conversie van digitale signalen van de derde telecommunicatiemiddelen naar een communicatiesignaal dat compatibel is met  
25 het telecommunicatienetwerk en andersom. Hierdoor is het mogelijk om digitale derde telecommunicatiemiddelen in het telecommunicatiesysteem op te nemen, hoewel het netwerk dit niet direct zou toestaan, bijvoorbeeld omdat het analoog is of andere signaalfrequenties hanteert. Voorbeelden van dergelijk digitale telecommunicatiemiddelen zijn computers, digitale telefooninrichtingen en diverse  
30 inrichtingen bestemd voor vele vormen van telemetrie en bediening op afstand.

Het is in het algemeen wenselijk om commercieel verkrijgbare telecommunicatiemiddelen in een telecommunicatiesysteem te kunnen gebruiken zonder de telecommunicatiemiddelen te behoeven te modificeren. Hierdoor is het systeem universeler inzetbaar en is de kans op storingen in de aan te sluiten apparatuur geringer.

5 Met het oog hierop heeft een bijzondere uitvoeringsvorm van het telecommunicatiesysteem volgens de uitvinding als kenmerk dat tussen de derdetelecommunicatiemiddelen en de conversiemiddelen een poorteenheid is gekoppeld en dat de poorteenheid enerzijds een aansluiting al of niet in combinatie met een interface heeft, specifiek afgestemd op de soort van derdetelecommunicatiemiddelen

10 en anderzijds geschikt is voor communicatie met de conversiemiddelen. De poorteenheid zorgt in dat geval voor eventueel noodzakelijke aanpassingen tussen de derdetelecommunicatiemiddelen enerzijds en de conversiemiddelen anderzijds en biedt tevens een standaard aansluiting voor de derdetelecommunicatiemiddelen. De derdetelecommunicatiemiddelen behoeven daardoor in het algemeen zelf geen nadere

15 modificatie om in het systeem te worden opgenomen.

Een verdere bijzondere uitvoeringsvorm van het telecommunicatiesysteem is in dit opzicht gekenmerkt doordat de poorteenheid geschikt is voor aansluiting van derdetelecommunicatiemiddelen uit een groep omvattende een al of niet in een

20 computernetwerk gekoppelde computer, een inrichting voor al niet digitale telefonie en een inrichting voor communicatie over een genormeerde seriële RS232 aansluiting. In zijn meest uitgebreide vorm beschikt de poorteenheid over al deze aansluitingen en de eventueel daarvoor benodigde interfaces, zodat daarop een grote diversiteit aan standaard telecommunicatieapparatuur direct kan worden aangesloten. Om specifieke

25 interfaces daarbij uit te sparen heeft een verdere uitvoeringsvorm al kenmerk dat de poorteenheid in staat is tot communicatie met de conversiemiddelen volgens een telecommunicatieprotocol dat integratie van verschillende telecommunicatiediensten toestaat, waardoor de signalen van verschillende soorten telecommunicatieapparatuur in voorkomende gevallen zonder tussenkomst van een specifieke interface door de

30 poorteenheid naar de conversiemiddelen kunnen worden geleid.



Een verdere uitvoeringsvorm heeft volgens de uitvinding als kenmerk dat de derde telecommunicatiemiddelen aan een lokaal digitaal telecommunicatienetwerk zijn gekoppeld, welke verder telecommunicatienetwerk door tussenkomst van de conversiemiddelen aan de ingang en de uitgang van de aansluitinrichting is gekoppeld.

5 Door de toevoeging van dit digitale netwerk is het mogelijk daarin digitale protocollen en digitale telecommunicatiediensten aan te bieden, die door het primaire netwerk mogelijk niet worden ondersteund. De conversiemiddelen zorgt daarbij voor de vereiste conversie tussen beide netwerken. Aldus wordt een hybride telecommunicatiesysteem bereikt dat enerzijds gebaseerd is op een primair netwerk met een hoogwaardige

10 infrastructuur waarin dankzij de uitvinding tweeweg signaalverkeer mogelijk is en anderzijds een lokaal netwerk dat bij de gebruiker de diverse telecommunicatiediensten ondersteunt die daar worden verlangd.

De uitvinding zal navolgend nader worden toegelicht aan de hand van een uitvoeringsvoorbeeld en een bijbehorende tekening. In de tekening toont:

15

figuur 1	een schematische weergave van een telecommunicatiesysteem volgens een uitvoeringsvorm van de uitvinding;
figuur 2	een schematische weergave van een eerste uitvoeringsvoorbeeld van een aansluitinrichting volgens de uitvinding, zoals gebruikt in het
20	telecommunicatiesysteem van figuur 1; en
figuur 3	een schematische weergave van een tweede uitvoeringsvoorbeeld van een aansluitinrichting volgens de uitvinding, bruikbaar in het
	telecommunicatiesysteem van figuur 1.

Overigens zij opgemerkt dat de figuren zuiver schematisch en niet op schaal zijn getekend. Met name zijn sommige dimensies in de tekening sterk overdreven

25 weergegeven. Omwille van de duidelijkheid zijn overeenkomstige delen in de figuren met eenzelfde verwijzingscijfer aangeduid.

Het telecommunicatiesysteem van figuur 1 omvat een bestaand kabeltelevisienetwerk l

30 primair bestemd voor doorgifte en distributie van radio- en televisieprogramma's. Aan het netwerk zijn eerste telecommunicatiemiddelen in de vorm van een radio-ontvanger

11 en een televisieontvanger 12 gekoppeld. Hiertoe bevindt zich bij de abonnee een centrale, gemeenschappelijke aansluiting 2 voor het netwerk 1, waarvan een specifieke combinatie-aansluiting 3 voor radio en televisie is afgetakt. Een dergelijk netwerk is gewoonlijk ontworpen voor distributie van signalen in discrete frequentiebanden die typisch in een bereik liggen van 5 MHz - 862 MHz, en de radio- en televisieontvanger zijn dan ook geschikt voor ontvangst van een eerste telecommunicatiesignaal in een frequentiedomein binnen deze grenzen. Het domein van 87,5-108 MHz is bijvoorbeeld bezet voor distributie van radioprogramma's, terwijl voor televisieprogramma's het domein van 115-862 MHz is gealloceerd.

Het gebied onder 87,5 MHz is dus nog vrij en wordt meer en meer gebruikt om daarin retourverkeer te laten plaatsvinden, dat wil zeggen signaalverkeer van de abonnee naar hoger in het netwerk gelegen delen. In dat geval zullen bij de abonnee tevens telecommunicatiemiddelen aanwezig zijn, zoals de in de figuur getoonde conversiemiddelen 21, decoder 34, computers 31, digitale telefoonsets 32 en/of analoge telefoontoestellen 33, welke in staat zijn tot het zenden van een tweede telecommunicatiesignaal, het retour signaal, in dit tweede frequentiedomein. De mogelijkheid van retourverkeer opent aldus de weg naar tal van interactieve telecommunicatiediensten over het netwerk 1, maar herbergt ook het gevaar voor het doordringen van ruis en andere verstoringen vanaf de abonnee in het netwerk, gewoonlijk aangeduid als ingress noise. Bovendien zal een retoursignaal dat bij de abonnee wordt gegenereerd, kunnen interfereren met het eerste telecommunicatiesignaal voor de ontvangende apparatuur indien beide aan die apparatuur worden aangeboden.

Om een en ander te vermijden zijn de ontvangende, eerste telecommunicatiemiddelen 11,12 en de zendende telecommunicatiemiddelen 21,31,32,33,34 volgens de uitvinding door tussenkomst van een aansluitinrichting 40 volgens de uitvinding, welke in figuur 2 in meer detail is weergegeven. De aansluitinrichting 40 omvat een gemeenschappelijke aansluiting 41 voor verbinding met het netwerk 1, een uitgang 42 voor de ontvangende eerste telecommunicatiemiddelen 11,12 en een ingang 43 voor eventueel aanwezige, zendende tweede telecommunicatiemiddelen 21. Conform de uitvinding omvat de

aansluitinrichting 40 naar de uitgang 42 en de ingang 43 afzonderlijke signaalpaden 44 respectievelijk 45 die door tussenkomst van scheidingsmiddelen 460 aan de gemeenschappelijke aansluiting zijn gekoppeld. De scheidingsmiddelen 460 omvatten een hoogdoorlaatfilter 461 waardoor het eerste communicatiesignaal uitsluitend over het eerste signaalpad 44 wordt geleid in combinatie met een laagdoorlaatfilter 462 dat het tweede communicatiesignaal over het tweede signaalpad 45 dwingt. In dit geval zijn beide filters geïntegreerd in een enkele component, aangeduid als diplexfilter, van meer dan -60 dB, doch voor de uitvinding is dit op zichzelf niet essentieel.

Doordat beide signalen althans in hoofdzaak strikt hun eigen signaalpad volgen, wordt interferentie tussen beide effectief tegen gegaan. Dit houdt onder meer in dat een retoursignaal dat vanuit de ingang 43 via het tweede signaalpad 45 zijn weg vervolgt, niet aan een uitgang 42 van de aansluitinrichting kan verschijnen, waaraan ontvangende toestellen 11, 12 zijn gekoppeld. Het uitgangsvermogen van de tweede telecommunicatiemiddelen kan dan ook binnen redelijke grenzen worden opgevoerd zonder gevaar voor storing op radio- en televisieprogramma's die immers althans in hoofdzaak strikt via het eerste signaalpad 44 aan de radio- en televisieontvanger worden aangeboden. Aldus kan het uitgangsvermogen de zendende telecommunicatiemiddelen vrij worden geoptimaliseerd voor het verkrijgen van een hoogwaardig uitgangssignaal zonder daarbij concessies te doen aan de kwaliteit van het signaal dat door de ontvangende telecommunicatiemiddelen wordt ontvangen.

De scheiding van beide signaalpaden 44,45 in de aansluiteenheid 40 zodanig dat voor het analoge signaalverkeer stroomafwaarts louter het eerste signaalpad 44 wordt gebruikt en het digitale signaalverkeer stroomopwaarts in het netwerk louter via het tweede signaalpad 45 loopt, biedt de mogelijkheid om in het eerste signaalpad gelijkrichtingsmiddelen 47 aan te brengen om ieder verkeer in het eerste signaalpad 44 in tegengestelde richting te onderdrukken. Het voordeel hiervan is dat eventuele ruis die bij de gebruiker wordt gegenereerd, aangeduid als ingress noise, niet langer een kans heeft via dit signaalpad 44 het netwerk 1 binnen te dringen. In dit voorbeeld wordt voor de gelijkrichtingsmiddelen een operationele versterker toegepast met een verzwakking

van meer dan -70 dB, wat in de praktijk ruimschoots voldoende is gebleken om ingress noise in het netwerk 1 voor een belangrijk deel te onderdrukken. Het retourpad 45 kent daarentegen met inbegrip van het filter 460 een verzwakking van niet meer dan slechts -1 dB, zodat retourverkeer langs deze zijde nog steeds mogelijk is. De toepassing van een operationele versterker 47 als gelijkrichtingsmiddelen biedt als bijkomend voordeel dat de versterkingsfactor daarvan, die hier circa 6 dB bedraagt, de verzwakking van zo'n -5,6 dB compenseert die het gevolg is van de splitter 48 die de uitgang 42 van de inrichting in drie vertakkingen opdeelt. Aldus heeft de gebruiker drie aansluitingen 42,42',42'' tot zijn beschikking om stroomafwaarts signaalverkeer aan het netwerk 1 te onttrekken. Althans een van deze aansluitingen 42'' is geciseleerd voor gelijkstroom doordat in het signaalpad daarnaar toe een condensator 49 is opgenomen. Deze aansluiting is met name bestemd voor hoogwaardige, veelal (hoog)spanningsgevoelige apparatuur die aldus elektrisch geciseleerd zijn van de overige apparatuur die aan een andere uitgang 42,42 van de eenheid 40 wordt gekoppeld, zoals bijvoorbeeld de eerste telecommunicatiemiddelen 11,12. De aansluiting 42'' biedt daarmee bescherming tegen een eventuele overspanning en slechte aarding van deze overige apparatuur. Een dergelijke afscherming geldt ook voor de ingang 43 van de inrichting, doordat eveneens in het tweede signaalpad 45 een condensator 49 is opgenomen.

Aan de aldus beschermde ingang 43 en uitgang 42'' van de eenheid 40 zijn tweede telecommunicatiemiddelen 21 gekoppeld, welke in dit voorbeeld conversiemiddelen omvatten in de vorm van een modulator-demodulatoreenheid, kortweg aangeduid als modem, dat specifiek geschikt is voor een kabeltelevisienetwerk, zoals het netwerk 1 van dit voorbeeld. Het modem is in staat tot een conversie van digitale signalen van de daaraan aangesloten apparatuur naar signalen geschikt voor transport in het netwerk 1 en andersom. Voor het ontvangen van signaalverkeer vanuit het netwerk 1, dat in het eerste frequentiedomein plaatsvindt, beschikt het modem 21 over een ingang 211 die daartoe aan de uitgang 42'' van de eenheid 40 is gekoppeld, terwijl aan een uitgang 212 retourverkeer in het tweede frequentiedomein wordt aangeboden en via de ingang 43 van de aansluiting 40 over het daarvoor bestemde signaalpad 45 wordt geleid. Het modem is aan staat om voor beide trajecten een specifieke modulatiefrequentie toe te

passen afgestemd op de scheidingsmiddelen 460 in de aansluiteenheid 40. Aan de andere zijde beschikt het modem 21 over een gecombineerde digitale ingang/uitgang 213 voor aansluiting van digitale, derdetelecommunicatiemiddelen, zoals de in dit voorbeeld getoonde computers 31, telefoons 32,33 en decoder 34.

5

De aansluiting van deze derdetelecommunicatiemiddelen 31..34 geschiedt in dit voorbeeld door tussenkomst van een poorteenheid 50. Deze poorteenheid heeft enerzijds aansluitingen al of niet in combinatie met noodzakelijke interfaces 51..54 afgestemd op de specifieke soort van derdetelecommunicatiemiddelen en anderzijds een

10 gemeenschappelijke poort 55 voor communicatie met het modem 21. Als zodanig beschikt de poorteenheid 50 in dit voorbeeld over een netwerkaansluiting 51 in combinatie met een gebruikelijke netwerk-interface voor een verder telecommunicatienetwerk 30 (LAN) van computers 31, een DECT aansluiting 52 in combinatie met een DECT interface voor aansluiting van digitale hand sets 32 van

15 draadloze telefoons gebaseerd op het DECT protocol, een aansluiting 53 met ingebouwde analoog/digitaal convertorinterface voor conventionele analoge telefoontoestellen 33 en een standaard RS 232 interface voor bijvoorbeeld telemetrie toepassingen, waarin in dit geval de decoder 34 is gekoppeld. De decoder 34 communiceert hierbij digitaal via de RS232 van de poorteenheid 50 met het netwerk 1

20 voor de uitwisseling van sleutel- en verificatie-informatie en laat anderzijds op een conventionele wijze analoge programmeergegevens vanuit het netwerk 1 en is daartoe direct aangesloten op een uitgang 42 van de aansluiteenheid.

Intern worden de signalen van al deze apparatuur zo nodig omgezet in een

25 gemeenschappelijk protocol, waarvoor in dit voorbeeld het Internet Protocol (TCP/IP) is gekozen dat op zichzelf reeds een integratie van diverse telecommunicatiediensten ondersteund. Op basis van dit protocol wordt door de poorteenheid en het modem 21 onderling gecommuniceerd. Aldus behoeven de derdetelecommunicatiemiddelen 31..34 niet te worden aangepast voor gebruik in combinatie met het modem 21 en het netwerk

30 1 en behoeft andersom in het netwerk 1 niet of nauwelijks rekening te worden te worden gehouden met het soort van apparatuur 31..34 die door de gebruiker zal worden ingezet.

De aansluiteenheid 40, het modem 21 en de poorteenheid 50 nemen ieder voor zich een aantal daarvoor noodzakelijke omzettingen c.q. aanpassingen voor hun rekening.

Overigens wordt ook in het computernetwerk 30 het Internet Protocol (TCP/IP) ondersteund, dat zowel datatransport als telefoonverkeer toestaat, zodat in plaats van via  
5 een daarvoor bestemde ingang van de poorteenheid 50 ook via het computernetwerk 30 telefoonverkeer mogelijk is.

Een tweede uitvoeringsvoorbeeld van de aansluitinrichting volgens de uitvinding is schematisch in figuur 3 weergegeven. Deze uitvoeringsvorm stemt grotendeels overeen  
10 met die van de figuren 1 en 2. De aansluitinrichting heeft een gemeenschappelijke aansluiting 41 voor een telecommunicatieverbinding, ook hier een CATV-netwerk, alsmede een separate ingang 43 en een aantal uitgangen 42,42',42" voor koppeling van respectievelijk zendende en ontvangende telecommunicatiemiddelen. De signaalpaden tussen de gemeenschappelijke aansluiting 43 en de ingang 41 respectievelijk de  
15 uitgangen 42,42',42" zijn van elkaar gescheiden door scheidingmiddelen in de vorm van een diplexfilter 460. Gelijk in het eerste uitvoeringsvoorbeeld biedt dit diplexfilter een eerste signaalpad tussen de aansluiting 43 en de uitgangen 42,42',42" voor louter signalen in een eerste frequentiebereik van, in dit voorbeeld, 47-862 MHz, terwijl in een tweede signaalpad tussen de aansluiting 43 en de ingang 41 als gevolg van het filter 460  
20 slechts signaaloverdracht mogelijk is in een tweede frequentiebereik van, in dit voorbeeld, circa 5-30 MHz. De onderlinge scheiding bedraagt daarbij -60 dB, maar kan in de praktijk naar wens hoger of eventueel lager worden genomen. Een laagdoorlaatfilter 46 met een grensfrequentie van circa 50 MHz zorgt in dit voorbeeld voor een extra onderdrukking van hoog-frequente signaalcomponenten in het signaalpad  
25 dat naar de ingang 41 leidt.

Een operationele versterker 47 in het eerste signaalpad naar de uitgangen 42,42',42" van de inrichting zorgt voor een effectieve onderdrukking van oneigenlijk retourverkeer langs dit signaalpad. De operationele versterker 47 is voorzien van een eigen,  
30 gestabiliseerde gelijkspanningsvoeding 471 voor een hoogwaardige signaalbewerking. Dankzij de operationele versterker 47 kan de introductie ingress noise in het netwerk dat

aan de aansluiting 43 is gekoppeld belangrijk worden tegengegaan. Om de distributie van radio- en televisieprogramma's vanuit het CATV het netwerk via de inrichting 40 ook bij het uitvallen van de voeding 471 te waarborgen, is parallel aan de operationele versterker een bypass-schakeling 472 opgenomen voorzien van een of meer normally-  
5 ON relais die bij het wegvallen van de voeding van de voedingsmiddelen 471 een open verbinding tussen de ingang 43 en de primaire uitgang 42 verzorgen. De voedingsspanning van de operationele versterker 461 wordt hiertoe tevens gebruikt als stuurspanning van deze schakeling 472.

10 Om te vermijden dat voornoemde ingress noise hinderlijk interfereert met het signaal dat van een andere uitgang 42,42',42" wordt afgenomen, zijn in dit uitvoeringsvoorbeeld in de signaalpaden tussen afzonderlijke uitgangen 42,42',42" verzwakkingsmiddelen opgenomen. De verzwakkingsmiddelen omvatten hier directionele koppelaars 62,62',62", ieder met een hoofdpad met geen of slechts een geringe verzwakking van  
15 hier -1 dB en aanmerkelijk sterker verzwakte aftakking waar het signaal in dit voorbeeld een verzwakking van circa -10dB ondergaat. Voor ieder uitgang 42,42',42" omvat de inrichting een dergelijke verzwakker 62,62',62", waarbij de uitgang 42,42',42" aan de aftakking daarvan is gekoppeld. De verzwakkers zijn achter elkaar in een hoofd-signaalpad geplaatst dat eindigt in een afsluiter 64 die met een impedantie van  $75 \Omega$  is  
20 afgestemd op het signaalpad om reflecties tegen te gaan.

De operationele versterker 47 kent een versterking van circa 17 dB. Dit betekent dat een ingangssignaal dat aan de aansluiting 43 wordt aangeboden, uitgaande van een verzwakking van circa -1dB door het diplexfilter 460, met een versterking van 16 dB  
25 aan de uitgang van de versterker 47 beschikbaar is. De eerste directionele koppelaar 61" zorgt voor een verzwakking van -10 dB, terwijl een aanvullende verzwakker 62 voor een additionele damping van -6 dB zorgt, waardoor het signaal op nagenoeg het ingangsniveau aan de eerste uitgang 42" kan worden afgenomen. De verzwakking in het hoofdpad van telkens -1 dB leidt ertoe dat aan de volgende uitgang 42' het signaal op  
30 een niveau van 5 dB en tenslotte aan de laatste uitgang 42 op 4 dB ten opzichte van het ingangsniveau beschikbaar is. Deze laatste twee uitgangen kunnen bijvoorbeeld worden

gebruikt voor aansluiting van radio-, televisie en videoapparatuur en desgewenst een settopbox voor daaraan gerelateerde telediensten en wat dies meer zij. Desgewenst kan het uitgangsniveau nog worden aangepast door tussen schakeling van een verzwakker zoals bij de eerste uitgang 42".

5

Hoewel aldus aan iedere uitgang 42,42',42" het aangeboden signaal beschikbaar is, zorgen de verzwakkingsmiddelen 62,62',62" ervoor dat tussen naburige uitgangen 42,42',42" een signaalscheiding van ten minste -20 dB aanwezig is. Eventuele ingress noise en andere interferenties afkomstig van een der uitgangen 42,42',42" zal daardoor een verzwakking van -20 dB ondervinden in een signaalpad naar een andere uitgang en daardoor praktisch volledig worden onderdrukt. Aldus wordt in de onderhavige uitvoeringsvorm niet alleen een effectieve signaalscheiding tussen de ingang 41 en een uitgang 42,42',42" van de inrichting bewerkstelligd, maar ook tussen de uitgangen 42,42',42" onderling.

15

De eerste uitgang 42" kan bijvoorbeeld in combinatie met de ingang 41 worden gebruikt voor aansluiting van een personal computer, al of niet in een netwerk, voorzien van een kabelmodem 21. Om deze elektronisch relatief gevoelige apparatuur te beschermen, zijn de daarvoor gebruikte aansluitingen 41,42" voorzien van een galvanisch scheiding in de vorm van een stel condensatoren 49. Een hoogspanning afkomstig van aan één der overige uitgangen 42,42' aangesloten televisieapparatuur zal daardoor minder gemakkelijk tot de pc-apparatuur kunnen doordringen.

20

Al met al voorziet de uitvinding in een bijzonder algemeen inzetbare oplossing voor aansluiting van allerhande telecommunicatieapparatuur op een gemeenschappelijke aansluiting 2 van een telecommunicatienetwerk 1, waarbij een hoogwaardige kwaliteit van de ontvangst- zowel als zendsignalen kan worden gerealiseerd, onderlinge interferentie zoveel mogelijk wordt uitgesloten en indringen van ruis vanaf de gebruiker in het netwerk belangrijk wordt onderdrukt.

25

30



Hoewel de uitvinding hiervoor aan de hand van louter enkele voorbeelden nader werd toegelicht, zal het duidelijk zijn dat de uitvinding geenszins tot de gegeven voorbeelden is beperkt, Integendeel zijn voor een gemiddelde vakman binnen het kader van de uitvinding nog vele variaties en verschijningsvormen mogelijk. Zo kan de poorteenheid  
5 naar wens worden uitgebreid of ingeperkt al naar gelang de diversiteit van de daarop aan te sluiten apparatuur. Voorst is de uitvinding nader beschreven aan de hand van een kabeltelevisienetwerk en daarvoor dan ook met name bruikbaar, doch niettemin ook inzetbaar voor andere typen netwerken, waarbij dankzij de uitvinding steeds een  
10 adequate scheiding mogelijk is tussen stroomopwaarts en stroomafwaarts signaalverkeer bij de gebruiker, opdat beide niet met elkaar interfereren.

Conclusies:

1. Aansluitinrichting voor het aan een gemeenschappelijke telecommunicatieverbinding koppelen van eerste telecommunicatiemiddelen in staat tot het ontvangen van een eerste telecommunicatiesignaal in een eerste frequentiedomein alsmede van tweede telecommunicatiemiddelen in staat tot het zenden van een tweede telecommunicatiesignaal in een tweede frequentiedomein, omvattende een uitgang voor de eerste telecommunicatiemiddelen, een ingang voor de tweede telecommunicatiemiddelen en een gemeenschappelijke aansluiting voor de telecommunicatieverbinding met het kenmerk dat de aansluitinrichting naar de ingang en de uitgang afzonderlijke signaalpaden omvat die door tussenkomst van scheidingsmiddelen aan de gemeenschappelijke aansluiting voor de telecommunicatieverbinding zijn gekoppeld en dat de scheidingsmiddelen in staat zijn om het eerste telecommunicatiesignaal althans nagenoeg uitsluitend over een eerste signaalpad tussen de uitgang en de gemeenschappelijk aansluiting en het tweede telecommunicatiesignaal althans nagenoeg uitsluitend over een tweede signaalpad tussen de gemeenschappelijke aansluiting en de ingang te leiden.
2. Aansluitinrichting volgens conclusie 1 met het kenmerk dat de scheidingsmiddelen frequentiefiltermiddelen omvatten in staat om beide telecommunicatiesignalen over hun respectieve signaalpaden te leiden.
3. Aansluitinrichting volgens conclusie 2 met het kenmerk dat de frequentiefiltermiddelen een laag-doorlaatfilter omvatten met een grenswaarde boven een laagste van het eerste- en tweede frequentiedomein alsmede een hoogdoorlaatfilter met een grenswaarde beneden een hoogste van het eerste- en tweede frequentiedomein.
4. Aansluitinrichting volgens een of meer der voorafgaande conclusies met het kenmerk dat in het signaalpad voor de eerste telecommunicatiemiddelen gelijkrichtingsmiddelen zijn opgenomen die in staat zijn om signaaltransport in een richting tegengesteld aan die van het eerste telecommunicatiesignaal tegen te gaan.

5. Aansluitinrichting volgens conclusie 4 met het kenmerk dat de  
gelijkrichtingsmiddelen een operationele versterker omvatten.
6. Aansluitinrichting volgens één of meer der voorafgaande conclusies met het  
5 kenmerk dat de inrichting een aantal uitgangen omvat, waarvan er ten minste één voor  
de tweede telecommunicatiemiddelen is bestemd.
7. Aansluitinrichting volgens conclusie 6 met het kenmerk dat in een signaalpad  
tussen een eerste uitgang en een tweede uitgang verzwakkingsmiddelen zijn  
10 opgenomen.
8. Aansluitinrichting volgens conclusie 7 met het kenmerk dat de  
verzwakkingsmiddelen ten minste één directionele koppelaar omvatten.
9. Aansluitinrichting volgens conclusie 6, 7 of 8 met het kenmerk dat althans de  
15 uitgang voor de tweede telecommunicatiemiddelen elektrisch is geïsoleerd voor  
gelijkstroom.
10. Telecommunicatiesysteem omvattende eerste telecommunicatiemiddelen in staat  
20 tot het ontvangen van een eerste telecommunicatiesignaal in een eerste  
frequentiedomein, tweede telecommunicatiemiddelen bestemd voor het zenden van een  
tweede telecommunicatiesignaal in een tweede frequentiedomein en een  
telecommunicatienetwerk met het kenmerk dat de eerste- en tweede  
telecommunicatiemiddelen door tussenkomst van de aansluitinrichting volgens één of  
25 meer der voorafgaande conclusies aan het telecommunicatienetwerk zijn gekoppeld.
11. Telecommunicatiesysteem volgens conclusie 10 met het kenmerk dat het  
telecommunicatienetwerk een kabeltelevisienetwerk omvat, bestemd voor distributie  
van radio- en/of televisieprogramma's en dat de eerste telecommunicatiemiddelen een  
30 radio-ontvanger en/of een televisie-ontvanger omvatten.

12. Telecommunicatiesysteem volgens conclusie 10 of 11 met het kenmerk dat de tweede telecommunicatiemiddelen conversiemiddelen omvatten die aan een ingang en een uitgang van de aansluitinrichting is gekoppeld en dat aan de conversiemiddelen digitale derde telecommunicatiemiddelen zijn gekoppeld.

5

13 Telecommunicatiesysteem volgens conclusie 12 met het kenmerk dat de derdetelecommunicatiemiddelen door tussenkomst van een poorteenheid aan de conversiemiddelen zijn gekoppeld en dat de poorteenheid een interface heeft, afgestemd op de soort van derdetelecommunicatiemiddelen.

10

14 Telecommunicatiesysteem volgens conclusie 13 met het kenmerk dat de poorteenheid geschikt is voor aansluiting van derdetelecommunicatiemiddelen uit een groep omvattende een al of niet in een computernetwerk gekoppelde computer, een inrichting voor al niet digitale telefonie en een inrichting voor communicatie over een genormeerde seriële RS 232 aansluiting.

15

15 Telecommunicatiesysteem volgens conclusie 13 of 14 met het kenmerk dat de poorteenheid in staat is tot communicatie met de conversiemiddelen volgens een telecommunicatieprotocol dat integratie van verschillende telecommunicatiediensten toestaat.

20

16. Telecommunicatiesysteem volgens conclusie 12, 13, 14 of 15 met het kenmerk dat de derde telecommunicatiemiddelen aan een digitaal verder telecommunicatienetwerk zijn gekoppeld, welke verder telecommunicatienetwerk door tussenkomst van de conversiemiddelen aan de ingang en de uitgang van de aansluitinrichting is gekoppeld.

25

17. Telecommunicatiesysteem volgens conclusie 16 met het kenmerk dat het verdere telecommunicatienetwerk verscheidene telecommunicatiediensten geïntegreerd ondersteunt.

30

-21-

18. Telecommunicatiesysteem volgens conclusie 17 met het kenmerk dat over het verdere telecommunicatienetwerk zowel dataverkeer als telefoonverkeer mogelijk is.

Uittreksel:

Telecommunicatiesysteem een aansluitinrichting ten gebruike daarin.

5

Een telecommunicatiesysteem omvattende eerste telecommunicatiemiddelen (11,12) in staat tot het ontvangen van een eerste telecommunicatiesignaal in een eerste frequentiedomein en tweede telecommunicatiemiddelen (21) bestemd voor het zenden van een tweede telecommunicatiesignaal in een tweede frequentiedomein en een telecommunicatienetwerk (1). De eerste- en tweede telecommunicatiemiddelen (11,12,21) zijn door tussenkomst van de aansluitinrichting (40) aan het telecommunicatienetwerk (1) gekoppeld. De aansluitinrichting (40) omvat naar een ingang (43) en een uitgang (42) daarvan afzonderlijke signaalpaden (44,45) die door tussenkomst van scheidingsmiddelen (460) aan een gemeenschappelijke aansluiting (41) bestemd voor het telecommunicatienetwerk (1) zijn gekoppeld. De eerste telecommunicatiemiddelen (11,12) zijn daarbij aan de uitgang (42) gekoppeld, terwijl de tweede telecommunicatiemiddelen (21) met de ingang (43) zijn verbonden. De scheidingsmiddelen (460) zijn daarbij in staat om het eerste telecommunicatiesignaal althans nagenoeg uitsluitend over een eerste signaalpad (44) tussen de uitgang (42) en de gemeenschappelijk aansluiting (41) en het tweede telecommunicatiesignaal althans nagenoeg uitsluitend over een tweede signaalpad (45) tussen de gemeenschappelijke aansluiting (41) en de ingang (43) te leiden.

Fig. 2

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>98.1067 W0</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/NL 99/ 00756</b>	International filing date (day/month/year) <b>09/12/1999</b>	(Earliest) Priority Date (day/month/year) <b>09/12/1998</b>
Applicant <b>TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

**NL 99/00756**



## INTERNATIONAL SEARCH REPORT

International Application No

NL 99/00756

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 08925 A (SCIENTIFIC ATLANTA) 21 March 1996 (1996-03-21) page 8, line 10 - line 21 page 11, line 3 -page 13, line 5 figures 4-6	1-11
A	WO 97 32411 A (ERICSSON RAYNET) 4 September 1997 (1997-09-04) page 3, line 5 -page 5, line 37 page 7, line 3 -page 17, line 27 figures 1-3	10-18

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

NL 99/00756

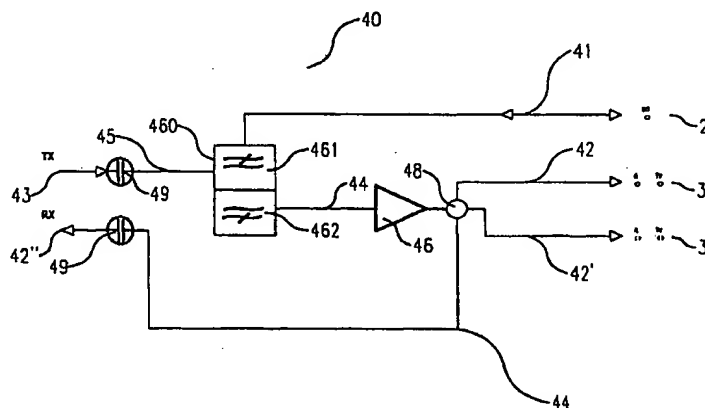
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(74) Agent: JILDERDA, Anne, Ayolt; Octrooibureau LIOC, P.O. Box 13363, NL-3507 LJ Utrecht (NL).		Published With international search report. In English translation (filed in Dutch).	

(54) Title: TELECOMMUNICATION SYSTEM AND CONNECTION DEVICE FOR USE IN IT



## (57) Abstract

A telecommunication system comprising first telecommunication means (11, 12) capable of receiving a first telecommunication signal in a first frequency range and second telecommunication means (21) capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network (1). The first and second telecommunication means (11, 12, 21) are coupled to the telecommunication network (1) via the connection device (40). The connection device (40) comprises separate signal paths (44, 45) to an input (43) and an output (42) thereof, which are coupled to a common connection (41) intended for the telecommunication network (1) via separation means (460). The first telecommunication means (11, 12) are herein coupled to the output (42), while the second telecommunication means (21) are connected to the input (43). The separation means (460) are herein capable of leading the first telecommunication signal at least almost exclusively over a first signal path (44) between the output (42) and the common connection (41) and the second telecommunication signal at least almost exclusively over a second signal path (45) between the common connection (41) and the input (43).

**Telecommunication system and connection device for use in it**

The present invention relates to a telecommunication system comprising first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network. The invention further relates to a connection device for coupling first telecommunication means, capable of receiving a first telecommunication signal in a first frequency range, together with second telecommunication means, capable of transmitting a second telecommunication signal in a second frequency range, to a single telecommunication connection, comprising an output for the first telecommunication means, an input for the second telecommunication means and a common connection for the telecommunication connection.

Telecommunication services take place for the most part over tailor-made telecommunication networks. Use is thus predominantly made for speech transfer of public telephone networks, referred to as PSTN (Public Switched Telephony Network), and for data exchange between computers numerous data networks specifically designed for this purpose are operational. Video and audio signals normally make their way through the ether and, in many industrialized countries, increasingly in cable television networks which are constructed on high-grade transport media such as glass fibre and coaxial cables. A user wishing to make use of all these services will consequently have to have at his disposal a corresponding number of connecting provisions.

The ongoing computerization of society results in ever further extension of existing telecommunication services, or even in the emergence of more and more new telecommunication services, which are moreover increasingly aimed at private users. In addition, these services are increasingly interactive, wherein high data transmission speed is sometimes desirable to enable transmission of large quantities of information to the user in an acceptable time. Examples hereof are forms of telemetry, pay-per-view

and in particular the internet, which moreover requires an increasingly higher data transmission speed due to the increasing implementation of multi-media applications.

5 Because the maximum data transmission speeds and the attainable band-width of a public telephone network are increasingly perceived as a limitation in such interactive services, an active search is under way for alternative networks for data transfer. A possible candidate here is the widespread cable television network such as has by now been laid in many industrialized countries. This network is distinguished from the public telephone network in that it is based on a high-grade transport medium right up to the end user which varies from high-grade glass-fibre connections in higher parts of the network to high-grade coaxial cables for connection of subscribers. Such connections offer a markedly greater band-width and allow a markedly higher transmission speed than the public telephone network to which subscribers are connected by means of a simple pair of copper wires twisted together. The integrity of digital signals in such a high-grade network can moreover be more readily guaranteed.

Cable television networks were however designed primarily for the distribution of radio and television programmes, this taking place in one direction from the network to the subscribers. Return traffic from the subscriber to parts located higher in the network, such as the second telecommunication signal from the second telecommunication means referred to in the preamble, was not anticipated in the first instance but is required more and more in present-day telecommunication. In order to make this latter possible, existing cable television networks are increasingly being upgraded and made suitable for two-way traffic. These modifications consist substantially of arranging bypass filters and bypass amplifiers enabling transmission of return signals in parallel to the existing amplifiers in the network. These return signals are herein situated in a relatively low frequency range which is not occupied by the radio and television channels to be distributed and which is troubled less by signal-damping. A problem which occurs here after such a modification of the network is that not only data transmission is possible in the return direction but that noise, referred to as ingress noise, which is also generated at the end user can now enter the network freely and is

transmitted in amplified manner. Ingress noise originates predominantly from connecting cables used in the home for connecting the equipment present therein. Such cables herein act as antennas which intercept possible electromagnetic disturbances in the home and pass them on to the cable network. This latter is of course undesirable, all  
5 the more so because it is precisely the lower frequency bands in which the digital data transport must take place which are relatively susceptible to noise.

Another circumstance is that, with two-way use of a cable television network, it is no longer only receiving appliances such as a radio or television receiver which will be  
10 present at an end user but also transmitting equipment for transmitting return signals. If all equipment is simply connected collectively to the existing connecting provision for the cable television network, the return signals of such transmitting equipment will inevitably also flow to the receiving appliances and can interfere with the communication signals intended therefor. Typical transmitting equipment for cable  
15 television networks normally has an optimal adjustment for transmitting signals without taking into account the influence thereof on other equipment which may also be present. The output level usually amounts herein to 80-115 dB $\mu$ V. Since television and radio signals are usually adapted to a standardized level of 60-80 dB $\mu$ V, this will rapidly result in a disturbing interference of the received radio and television  
20 programmes.

The present invention has for its object inter alia to provide a telecommunication system and a connection device of the type stated in the preamble enabling shared use of a connection of a telecommunication network, while the above described problems  
25 are at least for the greater part obviated.

In order to achieve the intended objective a connection device of the type stated in the preamble has the feature according to the invention that the connection device comprises separate signal paths to the input and output, which are coupled to the  
30 common connection for the telecommunication connection via separation means and in that the separation means are capable of leading the first telecommunication signal at

least almost exclusively over a first signal path between the output and the common connection and the second telecommunication signal at least almost exclusively over a second signal path between the common connection and the input. The invention is herein based on the insight that, with an effective separation at the user of the signal paths for downstream and upstream communication traffic, mutual interference and also inflow of noise into the network can be prevented. In the connection device according to the invention this means that upstream signal traffic, which will come from the second telecommunication means, is led wholly over the second signal path, while downstream signal traffic intended for the first telecommunication means finds its way via the first signal path. Both traffic flows are thus shielded from each other, so that mutual interference is prevented.

A particular embodiment of the connection device according to the invention is herein characterized in that the separation means comprise frequency filter means capable of leading both telecommunication signals over their respective signal paths. By causing the traffic in the two directions in the network to run at least substantially strictly in different frequency ranges, it is possible to provide the intended separation of the two signal paths in comparatively simple manner with such separation means. Such a particular embodiment according to the invention is more particularly characterized in that the frequency filter means comprise a low-pass filter with a threshold value above a lower one of the first and second frequency range, as well as a high-pass filter with a threshold value below a higher one of the first and second frequency range. The upstream traffic, including the second communication signal, herein preferably takes place in the lower frequency range, while the higher frequency range is allocated for the downstream traffic, such as the first communication signal. The lower frequency bands will still be available for return traffic in many existing cable television networks, so that the upstream traffic can take place therein. An additional advantage herein is the lesser signal damping at lower frequencies, so that fewer or less powerful amplifiers have to be arranged in the return path of the network.

- The at least substantially strict separation of the two signal paths in the connection device according to the invention also provides a possibility to greatly reduce the inflow of noise and other undesired signals into the network. For this purpose a preferred embodiment of the connection device is characterized according to the invention in that
- 5 the signal path for the first telecommunication means comprises rectifier means capable of suppressing at least a greater part of the signal transport in a direction opposite to that of the first telecommunication signal. Because the rectifier means largely suppress each signal flow in upstream direction in the first signal path, the entry of ingress noise into the network via the first signal path is effectively prevented. Because the desired
- 10 return traffic from the second telecommunication means takes place wholly in the separated second signal path, it is not disrupted by the rectifier means. A specific embodiment of the connection device has in this respect the feature according to the invention that the rectifier means comprise an operational amplifier.
- 15 In order to enable interactive services such as internet, telephony and pay-per-view, a further embodiment of the connection according to the invention is characterized in that the device comprises a number of outputs, at least one of which is intended for the second telecommunication means. Making use of this embodiment, outgoing signals from the second telecommunication means will run at least substantially strictly over
- 20 the second signal path, while incoming signals are led at least substantially strictly over the first signal path. This provides the second telecommunication means with the option of two-way traffic while retaining the advantages of the invention. Transmission of information herein takes place in the second frequency range, while information is received in the first frequency range. As a result of the invention full-duplex two-way
- 25 traffic is thus possible without disturbing interference of the incoming and outgoing signals. Since considerably more information will normally be received than transmitted, it is recommended to choose a first frequency range which is higher than the second, in view of the greater band-width in that higher range.
- 30 A further preferred embodiment herein has the feature according to the invention that attenuation means are present in a signal path between a first output and a second



output. A signal separation is thus effected not only between the input and the output of the device but also between the outputs mutually. Interference from one output to an adjacent output can be effectively suppressed by means of the attenuation means without the useful signal having to be impaired as a result. In this respect a further  
5 particular embodiment of the connection device according to the invention has the feature that the attenuation means comprise at least one directional coupler. Such a coupler has an input and at least two outputs, one of which has only a small attenuation and the other a significant one. An effective signal separation can be brought about by placing such elements between successive outputs.

10 In a further preferred embodiment the connection device according to the invention herein has the further feature that at least the output for the second telecommunication system is electrically insulated for a direct current. An electrical disconnection of the second telecommunication means is thus achieved in the case of direct current  
15 components in the signal supplied thereto via said connection. A possible overvoltage from the network or from the first telecommunication means does not in that case disrupt the second telecommunication means. This is particularly important if the first telecommunication means comprises an older type of television receiver, the chassis of which is in some cases under high voltage. If in this case the network connection in the  
20 television receiver is not adequately earthed, this preferred embodiment nevertheless avoids said high voltage having adverse consequences for the second telecommunication means.

25 In order to enable inter alia present-day, but also future telecommunication services, a telecommunication system of the type stated in the preamble has the feature according to the invention that the first and second telecommunication means are coupled to the telecommunication network via an above specified connection device according to the invention. The telecommunication network can herein be in principle any random existing or future network, but in a particular embodiment according to the invention  
30 comprises a cable television network intended for distribution of radio and/or television programmes, wherein the first telecommunication means comprise a radio receiver

and/or a television receiver. As already stated above, such a network generally offers an exceptionally high-grade infrastructure allowing large data flows and having low distortion.

5 A particular embodiment of the telecommunication system according to the invention is characterized in that the second telecommunication means comprise conversion means coupled on the one hand to an input and an output of the connection device and coupled on the other to digital third telecommunication means. The conversion means are capable of converting digital signals from the third telecommunication means into a  
10 communication signal compatible with the telecommunication network, and vice versa. It is hereby possible to include digital third telecommunication means in the telecommunication system even though the network would not directly allow this, for instance because it is analog or employs different signal frequencies. Examples of such digital telecommunication means are computers, digital telephone devices and diverse  
15 devices intended for many forms of telemetry and remote-control.

It is generally desirable to be able to use commercially obtainable telecommunication means in a telecommunication system without having to modify the telecommunication means. The system can hereby be employed more universally and there is less danger of  
20 disturbances in the equipment to be connected. With this in mind, a particular embodiment of the telecommunication system according to the invention has the feature that a gateway unit is coupled between the third telecommunication means and the conversion means and that the gateway unit has on the one hand a connection with or without an associated interface and specifically adapted to the type of third  
25 telecommunication means, and on the other is suitable for communication with the conversion means. The gateway unit in this case provides possible necessary adjustments between the third telecommunication means on the one hand and the conversion means on the other and also provides a standard connection for the third telecommunication means. The third telecommunication means themselves thereby  
30 generally require no further modification in order to be incorporated in the system.

A further particular embodiment of the telecommunication system is characterized in this respect in that the gateway unit is suitable for connection of third telecommunication means taken from a group of a computer in a network or stand-alone, means for analog or digital telephony and means for communication over a standard RS 232 serial port. In its most comprehensive form the gateway unit has available all of these connections and the interfaces possibly required therefor, so that a wide diversity of standard telecommunication equipment can be directly connected thereto. In order here to economize on specific interfaces, a further embodiment has the feature that the gateway unit is capable of communicating with the conversion means using a telecommunication protocol which allows the integration of different telecommunication services, whereby as the case arises the signals of different types of telecommunication equipment can be carried through the gateway unit to the conversion means without the intervention of a specific interface.

A further embodiment has the feature according to the invention that the third telecommunication means are coupled to a local digital telecommunication network, which further telecommunication network is coupled to the input and output of the connection device via the conversion means. Adding this digital network enables digital protocols and digital telecommunication services to be offered therein which may possibly not be supported by the primary network. The conversion means herein provide the required conversion between both networks. A hybrid telecommunication system is thus obtained which is based on the one hand on a primary network with a high-grade infrastructure in which two-way signal traffic is possible owing to the invention, and on the other hand a local network which supports at the user the diverse telecommunication services which are desired there.

The invention will be further elucidated hereinbelow with reference to an embodiment and an associated drawing. In the drawing:

figure 1 shows a schematic view of a telecommunication system as according to an embodiment of the invention;

figure 2 shows a schematic view of a first embodiment of a connection device according to the invention as used in the telecommunication system of figure 1; and

5 figure 3 shows a schematic view of a second embodiment of a connection device according to the invention which can be used in the telecommunication system of figure 1.

It is otherwise noted that the figures are purely schematic and not drawn to scale. Some dimensions in particular are greatly exaggerated in the drawing. For the sake of clarity corresponding parts are designated in the figures with the same reference numerals.

10 The telecommunication system of figure 1 comprises an existing cable television network 1 primarily intended for transmission and distribution of radio and television programmes. Coupled to the network are first telecommunication means in the form of a radio receiver 11 and a television receiver 12. Situated for this purpose at the  
15 subscriber is a central, common connection 2 for network 1, from which is branched a specific combination connection 3 for radio and television. Such a network is usually designed for distribution of signals in discrete frequency bands typically lying in a range of 5 MHz-862 MHz, and the radio and television receiver are therefore suitable for receiving a first telecommunication signal in a frequency range within these limits. The  
20 range of 87.5-108 MHz is for instance occupied for distribution of radio programmes, while the range of 115-862 MHz is allocated for television programmes.

The region below 87.5 MHz is therefore still free and is increasingly being used to have return traffic take place therein, i.e. signal traffic from the subscriber to parts located  
25 higher in the network. In this case telecommunication means will also be present at the subscriber, such as the conversion means 21, decoder 34, computers 31, digital telephone handsets and/or analog telephone apparatus 33 as shown in the figure, which are capable of transmitting a second telecommunication signal, the return signal, in this second frequency range. The option of return traffic thus opens the way to numerous  
30 interactive telecommunication services over network 1, but also holds the danger for the passage of noise and other disturbances from the subscriber into the network,

usually referred to as ingress noise. A return signal generated at the subscriber will moreover be able to interfere with the first telecommunication signal for the receiving equipment if both are supplied to this equipment.

- 5 In order to avoid this, the receiving first telecommunication means 11,12 and the transmitting telecommunication means 21,31,32,33,34 are connected according to the invention via a connection device 40 according to the invention as shown in more detail in figure 2. Connection device 40 comprises a common connection 41 for connection to the network 1, an output 42 for the receiving first telecommunication means 11,12 and
- 10 an input for transmitting second telecommunication means 21 which are optionally present. In accordance with the invention the connection device 40 comprises separate signal paths 44 respectively 45 to output 42 and input 43, which paths are coupled to the common connection via separating means 460. Separating means 460 comprise a high-pass filter 461 through which the first communication signal is led over only the
- 15 first signal path 44, in combination with a low-pass filter 462 which urges the second communication signal over the second signal path 45. In this case both filters are integrated into a single component, designated a duplex filter, of more than -60 dB, although this is not essential per se to the invention.
- 20 Because both signals follow at least substantially strictly their own signal path, interference between the two is effectively prevented. This implies among other things that a return signal continuing on its way from input 43 via second signal path 45 cannot appear at an output 42 of the connection device to which receiving appliances 11,12 are coupled. The output of the second telecommunication means can therefore be
- 25 increased within reasonable limits without the danger of interference of radio and television programmes, which are anyway provided at least substantially strictly via first signal path 44 to the radio and television receiver. The output of the transmitting telecommunication means can thus be freely optimized so as to obtain a high-quality output signal without therein making concessions to the quality of the signal being
- 30 received by the receiving telecommunication means.

The separation of the two signal paths 44,45 in connection unit 40 such that for the analog signal traffic downstream only the first signal path 44 is used and the digital signal traffic upstream in the network runs only via second signal path 45 provides the option of arranging rectifier means 47 in the first signal path to suppress any traffic in the opposite direction in first signal path 44. The advantage hereof is that possible noise generated at the user, referred to as ingress noise, no longer has the chance of reaching network 1 via this signal path 44. Used as rectifier means in this embodiment is an operational amplifier with an attenuation of more than -70 dB, which has been found in practice to be amply sufficient to suppress a significant part of ingress noise in network 1. Return path 45 on the other hand, including filter 460, has an attenuation of no more than only -1 dB, so that return traffic is still possible along this side. The use of an operational amplifier 47 as rectifier means has the additional advantage the gain thereof, which amounts here to about 6 dB, compensates the attenuation of about 5.6 dB resulting from the splitter 48 which divides output 42 of the device into three branches. The user thus has three connections 42,42',42" at his disposal to receive downstream signal traffic from network 1. At least one of these connections 42" is insulated for direct current in that a capacitor 49 is incorporated in the signal path thereto. This connection is specifically intended for high-grade, usually (high) voltage-sensitive equipment which is thus electrically insulated from the other equipment which is coupled to another output 42,42' of unit 40, such as for instance the first telecommunication means 11,12. Connection 42" thereby provides protection against a possible overvoltage and poor earthing of this other equipment. Such a protection also applies to the input 43 of the device, since a capacitor 49 is likewise incorporated in second signal path 45.

Coupled to the thus protected input 43 and output 42" of unit 40 are second telecommunication means 21 which in this embodiment comprise conversion means in the form of a modulator-demodulator unit, referred to in short as modem, which is specifically suitable for a cable television network such as the network 1 of this embodiment. The modem is capable of a conversion of digital signals from the equipment connected thereto into signals suitable for transport in network 1, and vice

versa. For receiving signal traffic from network 1, which takes place in the first frequency range, the modem 21 has an input 211 which is coupled for this purpose to the output 42" of unit 40, while return traffic in the second frequency range is supplied to an output 212 and led over the signal path 45 intended therefor via input 43 of connection unit 40. The modem is able to apply a specific modulation frequency for both routes which is adapted to separating means 460 in connection unit 40. On the other side the modem 21 has a combined digital input/output 213 for connection of digital third telecommunication means, such as the computers 31, telephones 32,33 and decoder 34 shown in this embodiment.

The connection of these third telecommunication means 31..34 takes place in this embodiment via a gateway unit 50. This gateway unit has on the one hand connections with or without necessary associated interfaces 51..54 and adjusted to the specific type of third telecommunication means and on the other a common port 55 for communication with modem 21. In this embodiment as such, gateway unit 50 has a network connection 51 in combination with a usual network interface for a further telecommunication network 30 (LAN) of computers 31, a DECT connection 52 in combination with a DECT interface for connection of digital hand-sets 32 of cordless telephones based on the DECT protocol, a connection 53 with built-in analog/digital converter interface for conventional analog telephone devices 33 and a standard RS 232 interface, for instance for telemetry applications, in which the decoder 34 is in this case coupled. Decoder 34 herein communicates digitally via the RS 232 of gateway unit 50 with network 1 for exchange of encryption and verification information and on the other hand passes analog programme data from network 1 in conventional manner and is connected for this purpose directly to an output 42 of the connection device.

If necessary, the signals from all this equipment are converted internally into a common protocol, for which purpose the Internet Protocol (TCP/IP) is chosen in this embodiment, this protocol already supporting per se an integration of diverse telecommunication services. Mutual communication between the gateway unit and modem 21 takes place on the basis of this protocol. The third telecommunication means

31..34 do not therefore have to be modified for use in combination with modem 21 and network 1 and, vice versa, it is not necessary, or hardly so, to take account in network 1 of the type of equipment 31..34 which will be deployed by the user. Connection device 40, modem 21 and gateway unit 50 will each deal with a number of conversions or adjustments necessary for this purpose. The Internet Protocol (TCP/IP), which allows both data transport and telephone traffic, is otherwise also supported in computer network 30, so that telephone traffic is also possible via computer network 30 instead of via an input of gateway unit 50 intended for that purpose.

10 A second embodiment of the connection device according to the invention is shown schematically in figure 3. This embodiment largely corresponds with that of figures 1 and 2. The connection device has a common connection 41 for a telecommunication connection, here also a CATV network, in addition to a separate input 43 and a number of outputs 42,42',42" for coupling of respective transmitting and receiving telecommunication means. The signal paths between common connection 43 and input 15 41 respectively outputs 42,42',42" are mutually separated by separating means in the form of a duplex filter 460. Similarly to the first embodiment, this duplex filter provides a first signal path between connection 43 and outputs 42,42',42" solely for signals in a first frequency range of, in this embodiment, 47-862 MHz, while in a second signal 20 path between connection 43 and input 41 signal transfer is only possible, as a result of filter 460, in a second frequency range of, in this embodiment, about 5-30 MHz. The mutual separation amounts herein to -60 dB, but can in practice be made higher or optionally lower as required. A low-pass filter 46 with a limit frequency of about 50 MHz provides in this embodiment an additional suppression of high-frequency signal 25 components in the signal path leading to input 41.

An operational amplifier 47 in the first signal path to outputs 42,42',42" of the device provides an effective suppressing of spurious return traffic along this signal path. Operational amplifier 47 is provided with its own stabilized direct current supply 471 30 for a high-grade signal processing. The introduction of ingress noise into the network coupled to connection 43 can be prevented to a significant extent by operational



amplifier 47. In order to ensure the distribution of radio and television programmes from the CATV network via device 40 even when power supply 471 fails, a bypass circuit 472 is arranged parallel to the operational amplifier and provided with one or more normally-ON relays which provide an open connection between input 43 and the primary output 42 when the supply from power supply means 471 falls away. The supply voltage of operational amplifier 461 is also used for this purpose as control voltage of this circuit 472.

In order to avoid said ingress noise interfering in disturbing manner with the signal taken from another output 42,42',42'', attenuation means are arranged in this embodiment in the signal paths between individual outputs 42,42',42''. The attenuation means here comprise directional couplers 62,62',62'', each with a main path having no or only little attenuation of here -1 dB, and a markedly more strongly attenuated branching where the signal in this embodiment undergoes an attenuation of about -10 dB. The device comprises such an attenuator 62,62',62'' for each output 42,42',42'', wherein output 42,42',42'' is coupled to the branching thereof. The attenuators are placed successively in a main signal path which ends in a terminator 64 which is adapted to the signal path with an impedance of 75  $\Omega$  in order to prevent reflections.

Operational amplifier 47 has an amplification of about 17 dB. This means that an input signal supplied to connection 43, assuming an attenuation of about -1 dB by diplex filter 460, arrives at the output of amplifier 47 with an amplification of 16 dB. The first directional coupler 61'' provides an attenuation of -10 dB, while an additional attenuator 62 provides an additional damping of -6 dB, whereby the signal can be taken from the first output 42'' at practically the input level. The attenuation in the main path of -1 dB in each case results in the signal being available at the following output 42' at a level of 5 dB and, finally, at the last output 42 at 4 dB relative to the input level. These two latter outputs can for instance be used for connection of radio, television and video equipment and, if desired, a settop box for tele-services related thereto and the like. The output level can if desired be further adjusted by interposing an attenuator such as at the first output 42''.

Although the supplied signal is thus available at each output 42,42',42", the attenuating means 62,62',62" ensure that a signal separation of at least -20 dB is present between adjacent outputs 42,42',42". Possible ingress noise and other interference from any of the outputs 42,42',42" will thereby undergo an attenuation of -20 dB in a signal path to another output and thereby be almost completely suppressed. Not only is an effective signal separation thus brought about in the present embodiment between input 41 and an output 42,42',42" of the device, but also between the outputs 42,42',42" mutually.

The first output 42" can for instance be used in combination with input 41 for connection of a personal computer, in a network or otherwise, provided with a cable modem 21. In order to shield this electronically relatively sensitive equipment, the connections 41,42" used for this purpose are provided with a galvanic separation in the form of a pair of capacitors 49. A high voltage coming from television equipment connected to either of the other outputs 42,42' will thereby be less easily able to reach the PC equipment.

All in all the invention provides a very generally applicable solution for connection of all types of telecommunication equipment to a common connection 2 of a telecommunication network 1, wherein a high quality of both reception and transmission signals can be realized, mutual interference is precluded to the greatest possible extent and ingress of noise from the user into the network is suppressed to a significant degree.

Although the invention has been further elucidated in the foregoing with reference to only a few embodiments, it will be apparent that the invention is in no way limited to the given examples. On the contrary, many variations and embodiments are still possible for the average skilled person within the scope of the invention. The gateway unit can thus be extended or restricted in accordance with the diversity of the equipment to be connected thereto. In addition, the invention is further described on the basis of a cable television network and therefore particularly applicable for that purpose, but it can nevertheless also be employed for other types of network, wherein as a result of the

invention an effective separation is always possible between upstream and downstream signal traffic at the user, so that the two do not interfere with each other.

**Claims**

1. Connection device for coupling first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, together with  
5 second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, to a single telecommunication connection, comprising an output for the first telecommunication means, an input for the second telecommunication means and a common connection for the telecommunication connection, **characterized in that** the connection device comprises separate signal  
10 paths to the input and output, which are coupled to the common connection for the telecommunication connection via separation means and in that the separation means are capable of leading the first telecommunication signal at least almost exclusively over a first signal path between the output and the common connection and the second telecommunication signal at least almost exclusively over a second signal path between  
15 the common connection and the input.
2. Connection device as claimed in claim 1, **characterized in that** the separation means comprise frequency filter means capable of leading both telecommunication signals over their respective signal paths.  
20
3. Connection device as claimed in claim 2, **characterized in that** the frequency filter means comprise a low-pass filter with a threshold value above a lower one of said first and second frequency range, as well as a high-pass filter with a threshold value below a higher one of said first and second frequency range.  
25
4. Connection device as claimed in one or more of the preceding claims, **characterized in that** the signal path for the first telecommunication means comprises rectifier means capable of suppressing signal transport in a direction opposite to that of  
30 the first telecommunication signal.

5. Connection device as claimed in claim 4, **characterized in that** the rectifier means comprise an operational amplifier.
6. Connection device as claimed in one or more of the preceding claims,  
5 **characterized in that** the device comprises a number of outputs, at least one of which is intended for the second telecommunication means.
7. Connection device as claimed in claim 6, **characterized in that** attenuation means are present in a signal path between a first output and a second output.  
10
8. Connection device as claimed in claim 7, **characterized in that** the attenuation means comprise at least one directional coupler.
9. Connection device as claimed in claim 6, 7 or 8, **characterized in that** at least  
15 the output for the second telecommunication means is electrically insulated for a direct current.
10. Telecommunication system comprising first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, second  
20 telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network, **characterized in that** the first and second telecommunication means are coupled to said network by means of the connection device as claimed in one or more of the preceding claims.
- 25 11. Telecommunication system as claimed in claim 10, **characterized in that** the telecommunication network comprises a cable television network intended for the distribution of radio and/or television programmes and in that the first telecommunication means comprise a radio receiver and/or a television receiver.
- 30 12. Telecommunication system as claimed in claim 10 or 11, **characterized in that** the second telecommunication means comprise conversion means coupled to an input

and an output of the connection device and in that digital third telecommunication means are coupled to said conversion means.

5 13. Telecommunication system as claimed in claim 12, **characterized in that** the third telecommunication means are coupled to the conversion means via a gateway unit and in that the gateway unit comprises an interface adapted to the type of third telecommunication means.

10 14. Telecommunication system as claimed in claim 13, **characterized in that** the gateway unit is suitable for connection of third telecommunication means taken from a group of a computer in a network or stand-alone, means for analog or digital telephony and means for communication over a standard RS 232 serial port.

15 15. Telecommunication system as claimed in claim 13 or 14, **characterized in that** the gateway unit is capable of communicating with the conversion means using a telecommunication protocol which allows the integration of different telecommunication services.

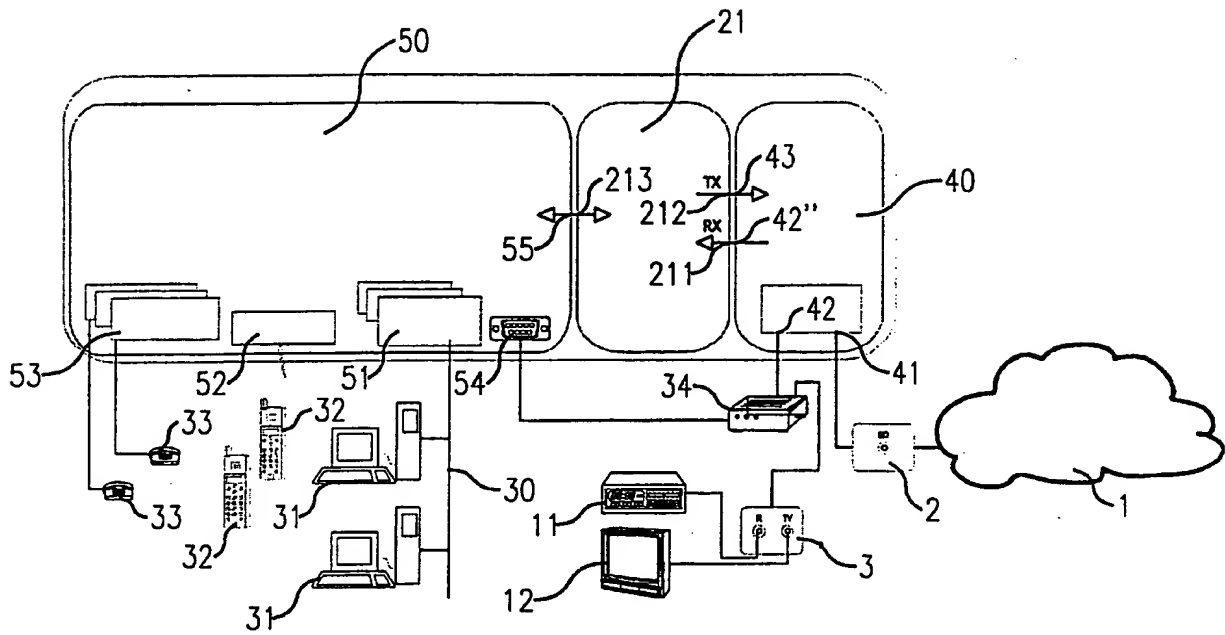
20 16. Telecommunication system as claimed in claim 12, 13, 14 or 15, **characterized in that** the third telecommunication means are coupled to a digital further telecommunication network, which further network is coupled to the input and output of the connection device via said conversion means.

25 17. Telecommunication system as claimed in claim 16, **characterized in that** the further network supports an integration of several telecommunication services.

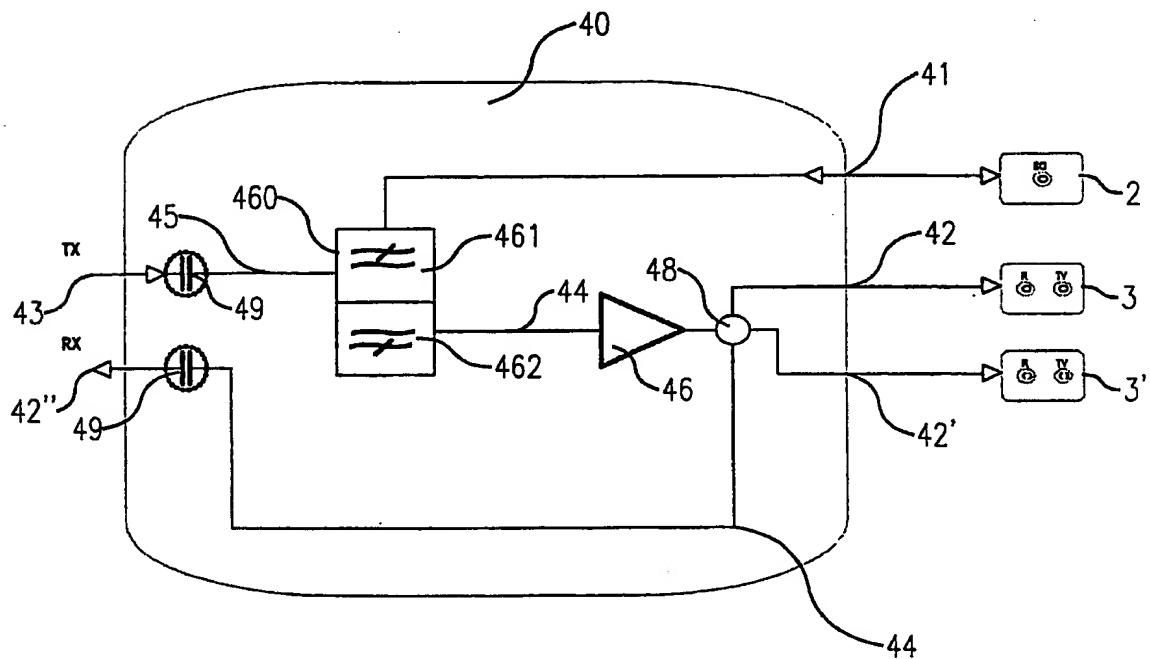
18. Telecommunication system as claimed in claim 17, **characterized in that** said further network supports data traffic as well as telephony.

ABSTRACT

A telecommunication system comprising first telecommunication elements (11, 12) capable of receiving a first telecommunication signal in a first frequency range and second telecommunication elements (21) capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network (1). The first and second telecommunication elements (11, 12, 21) are coupled to the telecommunication network (1) via the connection device (40). The connection device (40) comprises separate signal paths (44, 45) to an input (43) and an output (42) thereof, which are coupled to a common connection (41) intended for the telecommunication network (1) via separation elements (460). The first telecommunication elements (11, 12) are herein coupled to the output (42), while the second telecommunication elements (21) are connected to the input (43). The separation elements (460) are herein capable of leading the first telecommunication signal at least almost exclusively over a first signal path (44) between the output (42) and the common connection (41) and the second telecommunication signal at least almost exclusively over a second signal path (45) between the common connection (41) and the input (43).



**Fig.1**



**Fig.2**



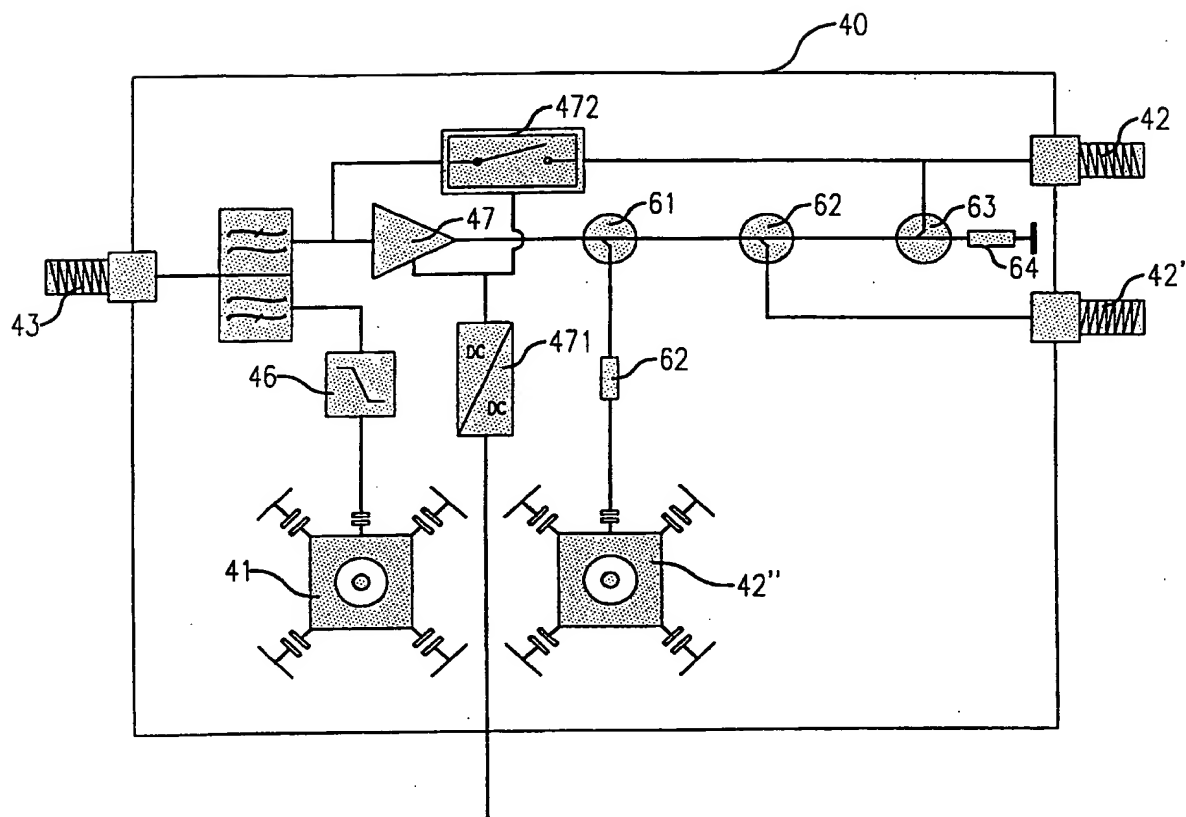


Fig.3

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00756

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 07276 A (COM21 INC) 19 February 1998 (1998-02-19) page 8, line 7 -page 9, line 13 page 21, line 3 -page 22, line 4 page 25, line 33 -page 26, line 24 page 28, line 24 -page 29, line 31 figures 16-20 ---	1-4, 6, 9-13
X	WO 96 18252 A (RAYCHEM CORP ; NEILL JOHN F O (US); ELDER MARK J (US); DIAZ STEPHEN) 13 June 1996 (1996-06-13) page 1, line 6 - line 12 page 3, line 23 -page 4, line 24 page 11, line 27 -page 12, line 2 page 13, line 1 - line 15 page 14, line 1 -page 17, line 32 figures 2-6 --- -/-	1-4, 6, 10, 11

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier document but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.  
"&" document member of the same patent family

Date of the actual completion of the international search

10 February 2000

Date of mailing of the international search report

16/02/2000

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

Inte. Application No  
PCT/NL 99/00756

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 08925 A (SCIENTIFIC ATLANTA) 21 March 1996 (1996-03-21) page 8, line 10 - line 21 page 11, line 3 -page 13, line 5 figures 4-6 ---	1-11
A	WO 97 32411 A (ERICSSON RAYNET) 4 September 1997 (1997-09-04) page 3, line 5 -page 5, line 37 page 7, line 3 -page 17, line 27 figures 1-3 -----	10-18

# INTERNATIONAL SEARCH REPORT

information on patent family members

Inter Application No

PCT/NL 99/00756

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9807276 A	19-02-1998	AU 3809297 A	06-03-1998
WO 9618252 A	13-06-1996	US 5729824 A	17-03-1998
		EP 0797880 A	01-10-1997
WO 9608925 A	21-03-1996	AU 692600 B	11-06-1998
		AU 3417195 A	29-03-1996
		AU 698649 B	05-11-1998
		AU 5968298 A	04-06-1998
		CA 2199815 A	21-03-1996
		US 5826167 A	20-10-1998
WO 9732411 A	04-09-1997	US 5805591 A	08-09-1998
		AU 1965897 A	16-09-1997
		EP 0893015 A	27-01-1999

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)





Applicant's or agent's file reference 98.1067 WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NL99/00756	International filing date (day/month/year) 09/12/1999	Priority date (day/month/year) 09/12/1998
International Patent Classification (IPC) or national classification and IPC H04N7/173		
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 18 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  06/07/2000	Date of completion of this report  10.01.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Loeser, E  Telephone No. +49 89 2399 8482  

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL99/00756

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

### Description, pages:

1-15 as received on 18/12/2000 with letter of 18/12/2000

### Claims, No.:

1-17 as received on 18/12/2000 with letter of 18/12/2000

### Drawings, sheets:

1,2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☒ the claims, Nos.: 18

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL99/00756

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	7,8,12-17
	No:	Claims	1-6,9-11
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-17
Industrial applicability (IA)	Yes:	Claims	1-17
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/NL99/00756

**1. General**

The present application does not satisfy the criteria set forth in Articles 6, 33(2) and 33(3) PCT. Details of the objections are set out below.

**2. Concerning Section VIII - Art. 6 PCT:**

The claims contravene the requirements set out in Art. 6 PCT, for the following reasons:

2.1. Claim 1

(a) The claim fails to clearly define whether the specified output etc. (p.16 line 8 ...) are comprised in the apparatus or not. A respective clarification might e.g. read "... said connection device comprising an output ...".

(b) The claim does not specify whether the first and the second frequency ranges are identical, partially overlap each other or do not overlap. Accordingly, it is not fully clear in which manner the claimed separation means have to operate.

The alleged invention as described appears to be based on separate (ie non-overlapping frequency ranges), and there is no disclosure that would support overlapping or identical frequency ranges. Accordingly, the claim's scope of protection is broader than supported by the description (Art. 6 PCT contravened).

This objection could be overcome by specifying the two frequency ranges as non-overlapping/different from each other as de facto supported by the description. Then, the skilled person would be enabled to correctly interpret the claimed term "separation means".

2.2. Claim 3



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/NL99/00756

The claimed filter means being defined in terms of edge frequencies in relation to the previously mentioned first and second frequency ranges, the claim is obscured due to the lack of a preceding clear definition of the two frequency ranges in relation to each other. Reference is made to paragraph 2.1.(b) above.

2.3. Claim 6

The claimed feature "attenuation means between the outputs of said connection device" can be interpreted as connecting an attenuator between two output terminals such as terminals 42 and 42', with the effect of establishing a coupling between these outputs. This is in strong contrast to the description according to which it is intended to decouple the outputs from each other. Thus the claim lacks support by the description (Art. 6 PCT contravened).

The description rather discloses means for decoupling output ports from each other (directional couplers which are used as signal splitters and provide the additional and beneficial effect of signal decoupling attenuation between their outputs), wherein the amount of decoupling can be defined in terms of attenuation.

It is conceded that the (true) signal attenuator referenced as 62 in Fig. 3 also effects decoupling, but this attenuator is inserted in the signal path and not arranged in the manner presently claimed.

**3. Concerning Section V - Articles 33(2) and 33(3) PCT**

The following documents are cited:

- D1: WO-A-98/07276;
- D2: WO-A-96/18252;
- D3: WO-A-96/08925;
- D4: WO-A-97/32411.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/NL99/00756

3.1. Claim 1

Document D1 (Fig.16: references 16, 82, 98, 84, 96, 94) discloses a converter (refs. 82, 98) that exhibits all features of claim 1 with the exception of the claimed "rectifier means capable of suppressing signal transport in a direction opposite to that of the first telecommunication signal", which is arranged in the first signal path. Accordingly, claim 1 is novel over D1.

Document D2 (Fig.3: references 300, 306, 316; Fig.4, Fig.6: ref. 600; Fig.7: ref. 800) also discloses a system with a converter (band split filter 300 or 800) for feeding a first signal in a first (high-band) frequency range HI downstream in a first signal path from a common cable system connector to a tuner 306 (Fig.3) or another signal receiving device 804 (Fig.7), and for feeding a second signal in a second (low-band LO) frequency range LO upstream in a second signal path from a data generating device to the cable system connector. In the first signal path, an amplifier 802 provides for forward gain and reverse isolation, thus this amplifier anticipates the claimed "rectifier means" in claim 1 on file.

Thus claim 1 is anticipated by the disclosure of D2 (Art. 33(2) PCT contravened) and is also obvious from the combination of D1 and D2 (Art. 33(3) contravened).

Document D4 (p.3 lines 5-24; Fig.2: refs. 42, 44, 46, 56, 51, 52 and related text passages, particularly p.9 lines 10-24) also anticipates the claimed subject-matter.

3.2. Dependent claims 2-17

(a) The additional features of claims 2 to 4 are also anticipated by at least D2 (see references above), so that the claims contravene Art. 33(2) PCT.

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(b) The features of claims 5 concerning the provision of a total two outputs towards different telecommunication devices is not anticipated by D1.

D2 discloses two such outputs in the first frequency band. This is apparent from the lower portion of Fig.7 in which a same communication means (refs. 804, 806, 808, 810, 812, 814) is connected the coaxial cable via converter 800 via both a HI-band reception path and a LO-band transmitting path. Thus the additional features of claim 5 are anticipated by D2 so that the claim contravenes Art. 33(2) and (3) PCT.

(c) The attenuation means claimed in claim 6 and interpreted in their broadest sense are anticipated by the band-splitting means 804 disclosed in D2 (Fig. 7), so that the claim contravenes Art. 33(2) PCT.

(d) The additional features of claim 7 do not appear to be anticipated by a single one of the presently available documents. However, using directional couplers for the purpose of isolating/decoupling signal terminals from each other was long and well known in the field of communications engineering. Thus the feature is at least obvious from D2 and the standard knowledge of the skilled person, so that the claim contravenes Art. 33(3) PCT.

These findings are supported by D2 (Fig.2A: ref.200) and D4 (Fig.2: ref.42).

(e) The additional features of claim 8 represent design options that were readily available to the skilled person seeking to implement the design disclosed in D2 and further seeking to establish/improve surge protection (which itself was a well-known design objective). Thus, the claim fails to establish an inventive step (Art. 33(3) contravened).

These findings are further supported by D1 (e.g. Fig.18 ref. 122 and the diplexer in Fig.19 having insulating capacitors).

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(f) The additional features of claims 9 and 10 are anticipated by D2 (Art. 33(2) contravened).

(g) D2 discloses a second communication device (Fig.7: refs 804,806,808,...814) representing a digital communicating means with is capable of sending and receiving digital data frames. Thus the disclosed system implies the presence of a digital third communication means as claimed in claim 11. Thus it is considered that the additional features of claim 11 are also anticipated by D2 so that the claim contravenes Art. 33(2) PCT.

(h) The additional features of claims 12-17 are considered obvious design options of the skilled person routinely seeking applications for and improvements to the system disclosed in D2. Thus these claims are considered to contravene Art. 33(3) PCT.

This is particularly so in view of the disclosure of D4.

**4. Concerning Section VII: Description and formal belongings**

(a) Claim 1 is not correctly drafted in the two-part form (Rule 6.3(b) PCT) because the features of both its preamble and its characterising portion are anticipated by a single document (D2) of the prior art.

(b) Documents reflecting the prior art described on pages 1-3 are not identified in the description (Rule 5.1(a)(ii) PCT).

(c) Contrary to the requirements set out in Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D2 and D4 identified above is not mentioned in the description, nor are these documents identified therein.

(d) The claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

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(e) On pages 13 and 14 and in Figs. 2 and 3, a number of errors are identified:

p.13 line 19: "common connection 43" should correctly read  
"common connection 41";

p.14 line 6 should correctly read "... 75 Ohms ...";

p.14 lines 21-22: "attenuating means" should correctly "coupling means";

Fig.2: The amplifier should correctly be referenced by "47" (see p.10 line 23 and Fig.3).

Fig.3: The duplex filter is not provided with a reference number ("460" should apply, cf description and Fig.2);

Fig.3:

- The left-hand connector should be referenced by 41 instead of 43.
- The couplers 62 and 63 should correctly be referenced by 61' and 62', respectively (see description).
- The connector presently referenced by 41 should be correctly referenced by 43 (compare with Fig.2).

Telecommunication system and connection device for use in it

The present invention relates to a telecommunication system comprising first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network. The invention further relates to a connection device for coupling first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, together with second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, to a single telecommunication network connection, comprising an output for the first telecommunication means, an input for the second telecommunication means, a common network connection for the telecommunication network and separation means adapted to directing the first telecommunication signal over a first signal path between the output and the common network connection and the second telecommunication signal over a second signal path between the common network connection and the input.

Telecommunication services take place for the most part over tailor-made telecommunication networks. Use is thus predominantly made for speech transfer of public telephone networks, referred to as PSTN (Public Switched Telephony Network), and for data exchange between computers numerous data networks specifically designed for this purpose are operational. Video and audio signals normally make their way through the ether and, in many industrialized countries, increasingly in cable television networks which are constructed on high-grade transport media such as glass fibre and coaxial cables. A user wishing to make use of all these services will consequently have to have at his disposal a corresponding number of connecting provisions.

The ongoing computerization of society results in ever further extension of existing telecommunication services, or even in the emergence of more and more new telecommunication services, which are moreover increasingly aimed at private users. In addition, these services are increasingly interactive, wherein high data transmission speed is sometimes desirable to enable transmission of large quantities of information to the user in an acceptable time. Examples hereof are forms of telemetry, pay-per-view

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and in particular the internet, which moreover requires an increasingly higher data transmission speed due to the increasing implementation of multi-media applications.

Because the maximum data transmission speeds and the attainable band-width of a public telephone network are increasingly perceived as a limitation in such interactive services, an active search is under way for alternative networks for data transfer. A possible candidate here is the widespread cable television network such as has by now been laid in many industrialized countries. This network is distinguished from the public telephone network in that it is based on a high-grade transport medium right up to the end user which varies from high-grade glass-fibre connections in higher parts of the network to high-grade coaxial cables for connection of subscribers. Such connections offer a markedly greater band-width and allow a markedly higher transmission speed than the public telephone network to which subscribers are connected by means of a simple pair of copper wires twisted together. The integrity of digital signals in such a high-grade network can moreover be more readily guaranteed.

Cable television networks were however designed primarily for the distribution of radio and television programmes, this taking place in one direction from the network to the subscribers. Return traffic from the subscriber to parts located higher in the network, such as the second telecommunication signal from the second telecommunication means referred to in the preamble, was not anticipated in the first instance but is required more and more in present-day telecommunication. In order to make this latter possible, existing cable television networks are increasingly being upgraded and made suitable for two-way traffic. These modifications consist substantially of arranging bypass filters and bypass amplifiers enabling transmission of return signals in parallel to the existing amplifiers in the network. These return signals are herein situated in a relatively low frequency range which is not occupied by the radio and television channels to be distributed and which is troubled less by signal-damping. A problem which occurs here after such a modification of the network is that not only data transmission is possible in the return direction but that noise, referred to as ingress noise, which is also generated at the end user can now enter the network freely and is transmitted in amplified manner.

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Ingress noise originates predominantly from connecting cables used in the home for connecting the equipment present therein. Such cables herein act as antennas which intercept possible electromagnetic disturbances in the home and pass them on to the cable network. This latter is of course undesirable, all the more so because it is precisely the lower frequency bands in which the digital data transport must take place which are relatively susceptible to noise.

Another circumstance is that, with two-way use of a cable television network, it is no longer only receiving appliances such as a radio or television receiver which will be present at an end user but also transmitting equipment for transmitting return signals. If all equipment is simply connected collectively to the existing connecting provision for the cable television network, the return signals of such transmitting equipment will inevitably also flow to the receiving appliances and can interfere with the communication signals intended therefor. Typical transmitting equipment for cable television networks normally has an optimal adjustment for transmitting signals without taking into account the influence thereof on other equipment which may also be present. The output level usually amounts herein to 80-115 dB V. Since television and radio signals are usually adapted to a standardized level of 60-80 dB V, this will rapidly result in a disturbing interference of the received radio and television programmes.

The present invention has for its object inter alia to provide a telecommunication system and a connection device of the type stated in the preamble enabling shared use of a connection of a telecommunication network, while the above described problems are at least for the greater part obviated.

In order to achieve the intended objective a connection device of the type stated in the preamble is according to the invention characterized in that said signal paths are separated from each other between the separation means and the input and output respectively and in that the first signal path comprises rectifier means capable of suppressing signal transport in a direction opposite to that of the first telecommunication signal. The invention is herein based on the recognition that, with an effective separation



at the user of the signal paths for downstream and upstream communication traffic, mutual interference and also inflow of noise into the network can be prevented. In the connection device according to the invention this means that upstream signal traffic, which will come from the second telecommunication means, is led exclusively over the second signal path, while downstream signal traffic intended for the first telecommunication means finds its way via the first signal path. Both traffic flows are thus separated from each other, so that mutual interference is prevented.

The provision of rectifier means within the first signal path greatly reduces the inflow of noise and other undesired signals into the network. Because the rectifier means largely suppress each signal flow in upstream direction in the first signal path, the entry of ingress noise into the network via the first signal path is effectively prevented. Because the desired return traffic from the second telecommunication means takes place wholly in the separated second signal path, it is not disrupted by the rectifier means. A specific embodiment of the connection device has in this respect the feature according to the invention that the rectifier means comprise an operational amplifier.

A particular embodiment of the connection device according to the invention is herein characterized in that the separation means comprise frequency filter means capable of leading both telecommunication signals over their respective signal paths. By causing the traffic in the two directions in the network to run at least substantially strictly in different frequency ranges, it is possible to provide the intended separation of the two signal paths in comparatively simple manner with such separation means. Such a particular embodiment according to the invention is more particularly characterized in that the frequency filter means comprise a low-pass filter with a edge frequency above a lower one of the first and second frequency range, as well as a high-pass filter with a edge frequency below a higher one of the first and second frequency range, while the edge frequency of the high-pass filter exceeds that of the low-pass filter. The upstream traffic, including the second communication signal, herein preferably takes place in the lower frequency range, while the higher frequency range is allocated for the downstream traffic, such as the first communication signal. The lower frequency bands will still be

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available for return traffic in many existing cable television networks, so that the upstream traffic can take place therein. An additional advantage herein is the lesser signal damping at lower frequencies, so that fewer or less powerful amplifiers have to be arranged in the return path of the network.

5

In order to enable interactive services such as internet, telephony and pay-per-view, a further embodiment of the connection according to the invention is characterized in that the device comprises a number of outputs, at least one of which is intended for the second telecommunication means. Making use of this embodiment, outgoing signals  
10 from the second telecommunication means will run at least substantially strictly over the second signal path, while incoming signals are led at least substantially strictly over the first signal path. This provides the second telecommunication means with the option of two-way traffic while retaining the advantages of the invention. Transmission of information herein takes place in the second frequency range, while information is  
15 received in the first frequency range. As a result of the invention full-duplex two-way traffic is thus possible without disturbing interference of the incoming and outgoing signals. Since considerably more information will normally be received than transmitted, it is recommended to choose a first frequency range which is higher than the second, in view of the greater band-width in that higher range.

20

A further preferred embodiment herein has the feature according to the invention that attenuation means are present in a signal path between a first output and a second output. A signal separation is thus effected not only between the input and the output of the device but also between the outputs mutually. Interference from one output to an  
25 adjacent output can be effectively suppressed by means of the attenuation means without the useful signal having to be impaired as a result. In this respect a further particular embodiment of the connection device according to the invention has the feature that the attenuation means comprise at least one directional coupler. Such a coupler has an input and at least two outputs, one of which has only a small attenuation and the other a  
30 significant one. An effective signal separation can be brought about by placing such elements between successive outputs.

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In a further preferred embodiment the connection device according to the invention herein has the further feature that at least the output for the second telecommunication system is electrically insulated for a direct current. An electrical disconnection of the second telecommunication means is thus achieved in the case of direct current components in the signal supplied thereto via said connection. A possible overvoltage from the network or from the first telecommunication means does not in that case disrupt the second telecommunication means. This is particularly important if the first telecommunication means comprises an older type of television receiver, the chassis of which is in some cases under high voltage. If in this case the network connection in the television receiver is not adequately earthed, this preferred embodiment nevertheless avoids said high voltage having adverse consequences for the second telecommunication means.

In order to enable inter alia present-day, but also future telecommunication services, a telecommunication system of the type stated in the preamble has the feature according to the invention that the first and second telecommunication means are coupled to the telecommunication network via an above specified connection device according to the invention. The telecommunication network can herein be in principle any random existing or future network, but in a particular embodiment according to the invention comprises a cable television network intended for distribution of radio and/or television programmes, wherein the first telecommunication means comprise a radio receiver and/or a television receiver. As already stated above, such a network generally offers an exceptionally high-grade infrastructure allowing large data flows and having low distortion.

A particular embodiment of the telecommunication system according to the invention is characterized in that the second telecommunication means comprise conversion means coupled on the one hand to an input and an output of the connection device and coupled on the other to digital third telecommunication means. The conversion means are capable of converting digital signals from the third telecommunication means into a communication signal compatible with the telecommunication network, and vice versa.

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It is hereby possible to include digital third telecommunication means in the telecommunication system even though the network would not directly allow this, for instance because it is analog or employs different signal frequencies. Examples of such digital telecommunication means are computers, digital telephone devices and diverse devices intended for many forms of telemetry and remote-control.

It is generally desirable to be able to use commercially obtainable telecommunication means in a telecommunication system without having to modify the telecommunication means. The system can hereby be employed more universally and there is less danger of disturbances in the equipment to be connected. With this in mind, a particular embodiment of the telecommunication system according to the invention has the feature that a gateway unit is coupled between the third telecommunication means and the conversion means and that the gateway unit has on the one hand a connection with or without an associated interface and specifically adapted to the type of third telecommunication means, and on the other is suitable for communication with the conversion means. The gateway unit in this case provides possible necessary adjustments between the third telecommunication means on the one hand and the conversion means on the other and also provides a standard connection for the third telecommunication means. The third telecommunication means themselves thereby generally require no further modification in order to be incorporated in the system.

A further particular embodiment of the telecommunication system is characterized in this respect in that the gateway unit is suitable for connection of third telecommunication means taken from a group of a computer in a network or stand-alone, means for analog or digital telephony and means for communication over a standard RS 232 serial port. In its most comprehensive form the gateway unit has available all of these connections and the interfaces possibly required therefor, so that a wide diversity of standard telecommunication equipment can be directly connected thereto. In order here to economize on specific interfaces, a further embodiment has the feature that the gateway unit is capable of communicating with the conversion means using a telecommunication protocol which allows the integration of different

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telecommunication services, whereby as the case arises the signals of different types of telecommunication equipment can be carried through the gateway unit to the conversion means without the intervention of a specific interface.

5 A further embodiment has the feature according to the invention that the third telecommunication means are coupled to a local digital telecommunication network, which further telecommunication network is coupled to the input and output of the connection device via the conversion means. Adding this digital network enables digital protocols and digital telecommunication services to be offered therein which may  
10 possibly not be supported by the primary network. The conversion means herein provide the required conversion between both networks. A hybrid telecommunication system is thus obtained which is based on the one hand on a primary network with a high-grade infrastructure in which two-way signal traffic is possible owing to the invention, and on the other hand a local network which supports at the user the diverse telecommunication  
15 services which are desired there.

The invention will be further elucidated hereinbelow with reference to an embodiment and an associated drawing. In the drawing:

figure 1 shows a schematic view of a telecommunication system as according to  
20 an embodiment of the invention;  
figure 2 shows a schematic view of a first embodiment of a connection device according to the invention as used in the telecommunication system of figure 1; and  
figure 3 shows a schematic view of a second embodiment of a connection device according to the invention which can be used in the telecommunication system of figure  
25 1.

It is otherwise noted that the figures are purely schematic and not drawn to scale. Some dimensions in particular are greatly exaggerated in the drawing. For the sake of clarity corresponding parts are designated in the figures with the same reference numerals.

30 The telecommunication system of figure 1 comprises an existing cable television network 1 primarily intended for transmission and distribution of radio and television

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programmes. Coupled to the network are first telecommunication means in the form of a radio receiver 11 and a television receiver 12. Situated for this purpose at the subscriber is a central, common connection 2 for network 1, from which is branched a specific combination connection 3 for radio and television. Such a network is usually designed for distribution of signals in discrete frequency bands typically lying in a range of 5 MHz-862 MHz, and the radio and television receiver are therefore suitable for receiving a first telecommunication signal in a frequency range within these limits. The range of 87.5-108 MHz is for instance occupied for distribution of radio programmes, while the range of 115-862 MHz is allocated for television programmes.

The region below 87.5 MHz is therefore still free and is increasingly being used to have return traffic take place therein, i.e. signal traffic from the subscriber to parts located higher in the network. In this case telecommunication means will also be present at the subscriber, such as the conversion means 21, decoder 34, computers 31, digital telephone handsets and/or analog telephone apparatus 33 as shown in the figure, which are capable of transmitting a second telecommunication signal, the return signal, in this second frequency range. The option of return traffic thus opens the way to numerous interactive telecommunication services over network 1, but also holds the danger for the passage of noise and other disturbances from the subscriber into the network, usually referred to as ingress noise. A return signal generated at the subscriber will moreover be able to interfere with the first telecommunication signal for the receiving equipment if both are supplied to this equipment.

In order to avoid this, the receiving first telecommunication means 11,12 and the transmitting telecommunication means 21,31,32,33,34 are connected according to the invention via a connection device 40 according to the invention as shown in more detail in figure 2. Connection device 40 comprises a common connection 41 for connection to the network 1, an output 42 for the receiving first telecommunication means 11,12 and an input for transmitting second telecommunication means 21 which are optionally present. In accordance with the invention the connection device 40 comprises separate signal paths 44 respectively 45 to output 42 and input 43, which paths are coupled to the

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common connection via separating means 460. Separating means 460 comprise a high-pass filter 461 through which the first communication signal is led over only the first signal path 44, in combination with a low-pass filter 462 which urges the second communication signal over the second signal path 45. In this case both filters are  
5 integrated into a single component, designated a duplex filter, of more than -60 dB, although this is not essential per se to the invention.

Because both signals follow at least substantially strictly their own signal path, interference between the two is effectively prevented. This implies among other things  
10 that a return signal continuing on its way from input 43 via second signal path 45 cannot appear at an output 42 of the connection device to which receiving appliances 11,12 are coupled. The output of the second telecommunication means can therefore be increased within reasonable limits without the danger of interference of radio and television programmes, which are anyway provided at least substantially strictly via first signal  
15 path 44 to the radio and television receiver. The output of the transmitting telecommunication means can thus be freely optimized so as to obtain a high-quality output signal without therein making concessions to the quality of the signal being received by the receiving telecommunication means.

20 The separation of the two signal paths 44,45 in connection unit 40 such that for the analog signal traffic downstream only the first signal path 44 is used and the digital signal traffic upstream in the network runs only via second signal path 45 provides the option of arranging rectifier means 47 in the first signal path to suppress any traffic in the opposite direction in first signal path 44. The advantage hereof is that possible noise  
25 generated at the user, referred to as ingress noise, no longer has the chance of reaching network 1 via this signal path 44. Used as rectifier means in this embodiment is an operational amplifier with an attenuation of more than -70 dB, which has been found in practice to be amply sufficient to suppress a significant part of ingress noise in network 1. Return path 45 on the other hand, including filter 460, has an attenuation of no more  
30 than only -1 dB, so that return traffic is still possible along this side. The use of an operational amplifier 47 as rectifier means has the additional advantage the gain thereof,

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which amounts here to about 6 dB, compensates the attenuation of about 5.6 dB resulting from the splitter 48 which divides output 42 of the device into three branches. The user thus has three connections 42,42',42" at his disposal to receive downstream signal traffic from network 1. At least one of these connections 42" is insulated for direct current in that a capacitor 49 is incorporated in the signal path thereto. This connection is specifically intended for high-grade, usually (high) voltage-sensitive equipment which is thus electrically insulated from the other equipment which is coupled to another output 42,42' of unit 40, such as for instance the first telecommunication means 11,12. Connection 42" thereby provides protection against a possible overvoltage and poor earthing of this other equipment. Such a protection also applies to the input 43 of the device, since a capacitor 49 is likewise incorporated in second signal path 45.

Coupled to the thus protected input 43 and output 42" of unit 40 are second telecommunication means 21 which in this embodiment comprise conversion means in the form of a modulator-demodulator unit, referred to in short as modem, which is specifically suitable for a cable television network such as the network 1 of this embodiment. The modem is capable of a conversion of digital signals from the equipment connected thereto into signals suitable for transport in network 1, and vice versa. For receiving signal traffic from network 1, which takes place in the first frequency range, the modem 21 has an input 211 which is coupled for this purpose to the output 42" of unit 40, while return traffic in the second frequency range is supplied to an output 212 and led over the signal path 45 intended therefor via input 43 of connection unit 40. The modem is able to apply a specific modulation frequency for both routes which is adapted to separating means 460 in connection unit 40. On the other side the modem 21 has a combined digital input/output 213 for connection of digital third telecommunication means, such as the computers 31, telephones 32,33 and decoder 34 shown in this embodiment.

The connection of these third telecommunication means 31..34 takes place in this embodiment via a gateway unit 50. This gateway unit has on the one hand connections



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with or without necessary associated interfaces 51..54 and adjusted to the specific type of third telecommunication means and on the other a common port 55 for communication with modem 21. In this embodiment as such, gateway unit 50 has a network connection 51 in combination with a usual network interface for a further telecommunication network 30 (LAN) of computers 31, a DECT connection 52 in combination with a DECT interface for connection of digital hand-sets 32 of cordless telephones based on the DECT protocol, a connection 53 with built-in analog/digital converter interface for conventional analog telephone devices 33 and a standard RS 232 interface, for instance for telemetry applications, in which the decoder 34 is in this case coupled. Decoder 34 herein communicates digitally via the RS 232 of gateway unit 50 with network 1 for exchange of encryption and verification information and on the other hand passes analog programme data from network 1 in conventional manner and is connected for this purpose directly to an output 42 of the connection device.

If necessary, the signals from all this equipment are converted internally into a common protocol, for which purpose the Internet Protocol (TCP/IP) is chosen in this embodiment, this protocol already supporting per se an integration of diverse telecommunication services. Mutual communication between the gateway unit and modem 21 takes place on the basis of this protocol. The third telecommunication means 31..34 do not therefore have to be modified for use in combination with modem 21 and network 1 and, vice versa, it is not necessary, or hardly so, to take account in network 1 of the type of equipment 31..34 which will be deployed by the user. Connection device 40, modem 21 and gateway unit 50 will each deal with a number of conversions or adjustments necessary for this purpose. The Internet Protocol (TCP/IP), which allows both data transport and telephone traffic, is otherwise also supported in computer network 30, so that telephone traffic is also possible via computer network 30 instead of via an input of gateway unit 50 intended for that purpose.

A second embodiment of the connection device according to the invention is shown schematically in figure 3. This embodiment largely corresponds with that of figures 1 and 2. The connection device has a common connection 41 for a telecommunication

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network, here also a CATV network, in addition to a separate input 43 and a number of outputs 42,42',42" for coupling of respective transmitting and receiving telecommunication means. The signal paths between common connection 41 and input 43 respectively outputs 42,42',42" are mutually separated by separating means in the form of a duplex filter 460. Similarly to the first embodiment, this duplex filter provides a first signal path between connection 43 and outputs 42,42',42" solely for signals in a first frequency range of, in this embodiment, 47-862 MHz, while in a second signal path between connection 43 and input 43 signal transfer is only possible, as a result of filter 460, in a second frequency range of, in this embodiment, about 5-30 MHz. The mutual separation amounts herein to -60 dB, but can in practice be made higher or optionally lower as required. A low-pass filter 46 with a limit frequency of about 50 MHz provides in this embodiment an additional suppression of high-frequency signal components in the signal path leading to input 43.

An operational amplifier 47 in the first signal path to outputs 42,42',42" of the device provides an effective suppressing of spurious return traffic along this signal path. Operational amplifier 47 is provided with its own stabilized direct current supply 471 for a high-grade signal processing. The introduction of ingress noise into the network coupled to connection 43 can be prevented to a significant extent by operational amplifier 47. In order to ensure the distribution of radio and television programmes from the CATV network via device 40 even when power supply 471 fails, a bypass circuit 472 is arranged parallel to the operational amplifier and provided with one or more normally-ON relays which provide an electrical connection between common connection 43 and the primary output 42 when the supply from power supply means 471 falls away. The supply voltage of operational amplifier 461 is also used for this purpose as control voltage of this circuit 472.

In order to avoid said ingress noise interfering in disturbing manner with the signal taken from another output 42,42',42", attenuation means are arranged in this embodiment in the signal paths between individual outputs 42,42',42". The attenuation means here comprise directional couplers 61,61',61", each with a main path having no or

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only little attenuation of here -1 dB, and a markedly more strongly attenuated branching where the signal in this embodiment undergoes an attenuation of about -10 dB. The device comprises such an attenuator 61,61',61" for each output 42,42',42", wherein output 42,42',42" is coupled to the branching thereof. The attenuators are placed  
5 successively in a main signal path which ends in a terminator 64 which is adapted to the signal path with an impedance of 75 in order to prevent reflections.

Operational amplifier 47 has an amplification of about 17 dB. This means that an input signal supplied to connection 43, assuming an attenuation of about -1 dB by diplex filter  
10 460, arrives at the output of amplifier 47 with an amplification of 16 dB. The first directional coupler 61" provides an attenuation of -10 dB, while an additional attenuator 62 provides an additional damping of -6 dB, whereby the signal can be taken from the first output 42" at practically the input level. The attenuation in the main path of -1 dB in each case results in the signal being available at the following output 42' at a level of  
15 5 dB and, finally, at the last output 42 at 4 dB relative to the input level. These two latter outputs can for instance be used for connection of radio, television and video equipment and, if desired, a set-top box for teleservices related thereto and the like. The output level can if desired be further adjusted by interposing an attenuator such as at the first output 42".

20 Although the supplied signal is thus available at each output 42,42',42", the attenuating means 61,61',61" ensure that a signal separation of at least -20 dB is present between adjacent outputs 42,42',42". Possible ingress noise and other interference from any of the outputs 42,42',42" will thereby undergo an attenuation of -20 dB in a signal path to  
25 another output and thereby be almost completely suppressed. Not only is an effective signal separation thus brought about in the present embodiment between input 43 and an output 42,42',42" of the device, but also between the outputs 42,42',42" mutually.

The first output 42" can for instance be used in combination with input 43 for  
30 connection of a personal computer, in a network or otherwise, provided with a cable modem 21. In order to shield this electronically relatively sensitive equipment, the

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connections 41,42" used for this purpose are provided with a galvanic separation in the form of a pair of capacitors 49. A high voltage coming from television equipment connected to either of the other outputs 42,42' will thereby be less easily able to reach the PC equipment.

5

All in all the invention provides a very generally applicable solution for connection of all types of telecommunication equipment to a common connection 2 of a telecommunication network 1, wherein a high quality of both reception and transmission signals can be realized, mutual interference is precluded to the greatest possible extent and ingress of noise from the user into the network is suppressed to a significant degree.

10

Although the invention has been further elucidated in the foregoing with reference to only a few embodiments, it will be apparent that the invention is in no way limited to the given examples. On the contrary, many variations and embodiments are still possible for the average skilled person within the scope of the invention. The gateway unit can thus be extended or restricted in accordance with the diversity of the equipment to be connected thereto. In addition, the invention is further described on the basis of a cable television network and therefore particularly applicable for that purpose, but it can nevertheless also be employed for other types of network, wherein as a result of the invention an effective separation is always possible between upstream and downstream signal traffic at the user, so that the two do not interfere with each other.

15

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## Claims

1. Connection device for coupling first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, together with  
5 second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, to a single telecommunication network connection, comprising an output for the first telecommunication means, an input for the second telecommunication means, a common network connection for the telecommunication network and separation means adapted to directing the first telecommunication signal  
10 over a first signal path between the output and the common network connection and the second telecommunication signal over a second signal path between the common network connection and the input characterized in that said signal paths are separated from each other between the separation means and the input and output respectively and in that the first signal path comprises rectifier means capable of suppressing signal  
15 transport in a direction opposite to that of the first telecommunication signal.
2. Connection device as claimed in claim 1, characterized in that the rectifier means comprise an operational amplifier.
- 20 3. Connection device as claimed in claim 1 or 2, characterized in that the separation means comprise frequency filter means adapted to directing both telecommunication signals over their respective signal paths.
4. Connection device as claimed in claim 3, characterized in that the frequency  
25 filter means comprise a low-pass filter with an edge frequency above a lower one of said first and second frequency range, as well as a high-pass filter with an edge frequency below a higher one of said first and second frequency range, while the edge frequency of the high-pass filter exceeds the edge frequency of the low-pass filter.
- 30 5. Connection device as claimed in one or more of the preceding claims, characterized in that the second telecommunication means are moreover capable of

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receiving a first telecommunication signal in a first frequency range and in that the device comprises at least one further output being intended for the second telecommunication means.

5        6.        Connection device as claimed in claim 5, characterized in that attenuation means are connected between said outputs of said connection device.

7.        Connection device as claimed in claim 6, characterized in that the attenuation means comprise at least one directional coupler.

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8.        Connection device as claimed in claim 5, 6 or 7, characterized in that at least the output for the second telecommunication means is electrically insulated for a direct current.

15        9.        Telecommunication system comprising first telecommunication means capable of receiving a first telecommunication signal in a first frequency range, second telecommunication means capable of transmitting a second telecommunication signal in a second frequency range, and a telecommunication network, characterized in that the telecommunication system comprises a connection device as claimed in one or more of  
20        the preceding claims connecting the first and second telecommunication means to said network.

10.       Telecommunication system as claimed in claim 9, characterized in that the telecommunication network comprises a cable television network intended for the  
25        distribution of radio and/or television programmes and in that the first telecommunication means comprise a radio receiver and/or a television receiver.

11.       Telecommunication system as claimed in claim 9 or 10, characterized in that the system moreover comprises digital third communication means, in that the second  
30        telecommunication means comprise signal conversion means which are coupled to an input and an output of the connection device on the one hand and to said third

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telecommunication means on the other hand and in that the conversion means are capable of converting digital signals from the third telecommunication means into a communication signal compatible with the telecommunication network, and vice versa.

- 5      12.      Telecommunication system as claimed in claim 11, characterized in that is comprises a gateway unit connecting the third telecommunication means to the conversion means and in that the gateway unit comprises an interface adapted to the specific type of third telecommunication means.
- 10      13.      Telecommunication system as claimed in claim 12, characterized in that the gateway unit is adapted to connecting third telecommunication means taken from a group of a computer, means for analog or digital telephony and means for communication over a standard RS 232 serial port.
- 15      14.      Telecommunication system as claimed in claim 12 or 13, characterized in that the gateway unit is adapted to communicating with the conversion means using a telecommunication protocol which allows the integration of different telecommunication services.
- 20      15.      Telecommunication system as claimed in claim 11, 12, 13 or 14, characterized in that the third telecommunication means are coupled to a digital further telecommunication network, which further network is coupled to the input and output of the connection device via said conversion means.
- 25      16.      Telecommunication system as claimed in claim 15, characterized in that the further network supports an integration of several telecommunication services.
17.      Telecommunication system as claimed in claim 16, characterized in that said further network supports data traffic as well as telephony.